THE MEASUREMENT OF OCCUPATIONAL APTITUDE

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THE HISTORY of the measurement of psychological traits extends back more than half a century. The vast literature in this area can be subsumed under three headings: methodological considerations with respect to problems of measurement, analysis of the nature and characteristics of the psychological traits being measured, and the prediction of behavior by means of test scores. Studies included in the last category are of obvious practical value. However, they are important for theory also, since correlations between test scores and behaviors of designated sorts permit further meanings to be attached to particular tests, and hence more precise statements can be made on the nature of the traits they measure.

Of the various kinds of behaviors that have been studied in relation to prediction by test scores, one of the most important is the individual's behavior in connection with his job. For over half a century tests have been used in the selection and placement of workers in business, industry, and government, and in the classification of military personnel in the armed forces. In these uses, predictions of job performance are made on the basis of test scores. Persons for whom a high level of success is indicated are selected and the others are rejected. By this means it is anticipated that work will be more effectively accomplished, and that individuals will obtain employment that is commensurate with their talents.

Because of the practical and theoretical importance of studies of the power of tests to predict occupational performance, it would not be surprising to find an extensive literature on the subject. Yet when one scans the publications for the last thirty years wherein this literature is to be found, the number of pertinent and factual reports turns out to be relatively small. Not only is the total amount of information considerably less than might be anticipated, but summaries of findings are not entirely satisfactory. O. K. Buros' *Mental Measurement Yearbook* (Rutgers University Press), which is periodically revised from time to time, provides critical reviews of a large number of tests. However, it evaluates principally the standard published tests and does not systematically or extensively review validity for wide ranges of occu-

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pations. Several books concerned with the use of tests in the selection and placement of workers discuss their validities, but none is intended to be a complete review of the literature.[1]

A comprehensive review of the experimental investigation of the occupational validities of tests would be of great value. It is the purpose here to provide such a review in order to integrate the findings of pertinent studies so that generalizations and trends may be established. The present author attempted such a review earlier, but at that time the results of the vast amount of work done during World War II were not generally available.[2] However, the approach employed in the earlier study appears to have considerable merit, and the same general pattern will be followed here.

PURPOSE AND PLAN

The objective of this monograph is to summarize, in a concise and integrated fashion, the results of all investigations concerned with the validities of tests used in the selection and placement of workers. The review is restricted to aptitude tests, since tests of job knowledge and of job skill are highly specific in nature. The pertinent published literature from 1919 to date was searched. To this material were added the results of a number of unpublished investigations. Studies conducted by various private and governmental organizations were sought and received.[3]

The specific purpose of this monograph is to obtain a representative value of the validity of each type of test for each type of job. The tables present such values in the form of average validity coefficients. Thus one could ascertain the types of tests that give the best predictions of success for any given type of job, or the types of jobs for which success is best predicted by any given type of test.

METHODOLOGICAL CONSIDERATIONS

In making the desired type of summary, one is faced with four methodological problems: the classification of jobs, the classification of tests, the classification of measures of job success, and the combination of results from various investigations. None of the solutions to these problems is wholly satisfactory. Conceptualizations and empirical findings with respect to the ways in which jobs can be classified are conspicuously few. Ordinarily, with problems such as this, tests are organized into types on grounds that are termed logical. However, critical examination suggests that such grounds are frequently intuitive or merely arbitrary. Thus no objective basis is afforded either for classifying jobs and tests or for evaluating any given system of classification. Obviously it is hazardous to combine the results of investigations which differ in methods and subjects employed. The rigid methodologist will say that such combinations cannot and should not be made. Others, who would permit such combinations, will disagree on the means to be utilized. It is hoped that consistencies and trends in validity will provide something of a safeguard against overgeneralization.

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[1] H. E. Burtt, *Principles of Employment Psychology* (Harper and Bros., 1942); W. H. Stead *et al.*, *Occupational Counseling Techniques* (American Book Co., 1940); C. H. Lawshe, *Principles of Personnel Testing* (McGraw-Hill Book Co., 1948); R. M. Dorcus and H. M. Jones, *Handbook of Employee Selection* (McGraw-Hill Book Co., 1950).

[2] E. E. Ghiselli, The validity of commonly employed occupational tests, *Univ. Calif. Publ. Psychol.*, 1949, 5, 253–288.

[3] See the Bibliography for published works from which material was drawn for the present study.

CLASSIFICATION OF JOBS

Estimates of the number of different kinds of jobs in the United States vary markedly. Obviously, the number arrived at in any such estimate is a function of how jobs are defined and classified. Thus one could speak of the job of clerk, or with greater and greater degrees of specificity the job of business machine operator, computing machine operator, calculating machine operator, Monroe calculating machine operator, Monroe calculating machine operator in Company X, Monroe calculating machine operator in Department Y of Company X.

Several systems of classifying jobs into types have been developed. For the most part they serve purposes so specific (e.g., enumeration) that they are of little help for the present problem. Two of these systems, however, are widely used and are especially helpful when dealing with problems of personnel placement. Both systems were developed by the United States Department of Labor. They are here termed the system of the *Dictionary of Occupational Titles*[4] and the system of entry occupations.[5] In the first system, jobs are generally classified in accordance with the industry in which they fall. In the second system, jobs are classified in terms of the nature of the work; this system is especially useful in vocational counseling. The jobs in each of the studies reviewed here were classified in accordance with both systems. In the tables to follow a more exact picture of the nature of these systems of classification can be ascertained. Both systems assign code numbers to jobs, and these accompany the job titles in the tables.

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[4] U. S. Department of Labor, *Dictionary of Occupational Titles,* Parts I, II, III (U. S. Govt. Printing Office, 1939 and 1945).

[5] War Manpower Commission, *Dictionary of Occupational Titles,* Part IV (U. S. Govt. Printing Office, 1944).

TABLE 1

CATEGORIES AND JOBS, GENERAL OCCUPATIONAL CLASSIFICATION SYSTEM

10	Supervisory occupations	
	11	General supervisors (e.g., store managers, office supervisors)
	12	Foremen
20	Clerical occupations	
	21	General clerks
	22	Recording clerks (e.g., typists, stenographers)
	23	Computing clerks (e.g., bookkeepers, comptometer operators)
30	Sales occupations	
	31	Sales clerks (e.g., department store salespersons)
	32	Salesmen (e.g., insurance salesmen)
40	Protective occupations (e.g., policemen, firemen)	
50	Service occupations (e.g., waiters, hospital attendants	
60	Vehicle operators	
70	Trades and crafts	
	71	Mechanical repairmen
	72	Electrical workers
	73	Structural workers
	74	Processing workers
	75	Complex machine operators
	76	Machining workers
80	Industrial occupations	
	81	Machine tenders
	82	Bench workers and assemblers
	83	Inspectors
	84	Packers and wrappers
	85	Gross manual workers

For some purposes, however, the classification of jobs given by the *Dictionary of Occupational Titles* and by entry occupations is too specific. Jobs are broken down into such fine divisions that general trends cannot be ascertained. Therefore a broader classification, a general occupational classification, was developed by the author of this monograph. It groups jobs in terms of the general nature of the work. The categories and code numbers for this system are given in table 1.

CLASSIFICATION OF TESTS

As reports of occupational validities of tests were reviewed, it appeared that the commonly employed aptitude tests could be classified in six major rubrics: intellectual abilities, spatial perception, perception of details, mechanical comprehension, motor abilities, and personality traits. Under tests of intellectual abilities are grouped intelligence, immediate memory, substitution, and arithmetic tests. For tests of spatial perception there are two specific types, tests of spatial relations and location tests. Tests of perception of details include number comparison, name comparison, cancellation, pursuit, and perceptual speed tests. While several different kinds of mechanical comprehension tests have been developed, the only commonly used type is that of mechanical principles. Many varieties of tests of motor abilities have been utilized: tracing, tapping, dotting, finger dexterity, hand dexterity, and arm dexterity tests. In addition, for jobs in the transportation industry, extensive use has been made of reaction time and complex reaction tests. Strictly speaking, the measures of personality treated here are not tests but questionnaires and inventories. For present purposes, personality and interest inventories and personal data questionnaires are listed. A description of each type of test follows:

TESTS OF INTELLECTUAL ABILITIES

Intelligence.—All the tests that are ordinarily termed intelligence or mental alertness tests are included in this category. Examples are the Otis tests and the Army General Classification Test.

Immediate memory.—In these tests the subject is presented with some material, and after a short period of time he is called upon to remember it. For example, five or ten place numbers might be listed on one side of the page; the subject is required to read each number, turn the page, and write the number in an appropriate place on the opposite side. These tests have also been called number writing, recall, and memory for details.

Substitution.—These tests require the subject to learn and utilize a code, such as $A = 7$, $B = 2$, and so on. He may be asked to make appropriate substitutions of numbers in a random order of letters, referring to the code as frequently as he desires.

Arithmetic.—Here are included all tests that require arithmetic computations. Sometimes a test may have face validity, being presented, for example, as a change-making test.

TESTS OF SPATIAL PERCEPTION

Spatial relations.—Spatial judgments of various sorts are required by these tests. In the most common kind the subject must determine the shape of the composite figure that will result when several plane figures are assembled. All paper-and-pencil tests of spatial relations, such as the Minnesota Paper Form Board Test and the block counting items of the MacQuarrie Mechanical Ability Test, are included in this category.

Location.—In this kind of test the subject must identify the location of each of a series of points and (or) make judgments concerning the distances between them. In some tests he simply has to identify the greatest or smallest distance; in others, he must reproduce a pattern on a different scale. The copying and location parts of the MacQuarrie Mechanical Ability Test are examples.

TESTS OF PERCEPTION OF DETAILS

Number comparison.—These tests consist of a series of pairs of numbers. Both members of each pair contain the same number of digits, varying from five to fifteen. In some pairs all digits are exactly the same; in others, one or two are different. The subject indicates which pairs are the same and which are different. An example is the number-comparison part of the Minnesota Clerical Test.

Name comparison.—These tests are similar to the foregoing type, except that pairs of names are used instead of pairs of numbers. The name-comparison part of the Minnesota Clerical Test is an example.

Cancellation.—Tests of this kind consist of letters or numbers arranged at random; the subject crosses out all letters or numbers of a specified kind.

Pursuit.—Pursuit tests present tangles of lines; the task is to follow, by eye alone, one line at a time from beginning to end through the tangle. The pursuit part of the MacQuarrie Mechanical Ability Test is an example.

Perceptual speed.—The intent is to measure the speed with which similarities and differences in simple figures can be perceived.

TESTS OF MECHANICAL COMPREHENSION

Mechanical principles.—In these tests problems illustrative of simple mechanical principles are presented pictorially. The problems involve such things as the power of levers and the directions and speed of movements of combinations of pulleys and gears. An example is the Bennett Mechanical Comprehension Test.

TESTS OF MOTOR ABILITIES

Tracing.—Tests in this category are intended to measure speed and precision of movement. An example is the tracing part of the MacQuarrie Mechanical Ability Test, which requires the subject to follow a prescribed path with a pencil.

Tapping.—In this category are included only tests of the paper-and-pencil variety. Emphasis is upon speed of movement; typically the subject taps as rapidly as he can with a pencil, putting two or three dots in each of a series of squares or circles. The tapping part of the MacQuarrie Mechanical Ability Test is an example.

Dotting.—This test is similar to the tapping test except that precision of movement is stressed. As in the dotting part of the MacQuarrie Mechanical Ability Test, the subject puts a single dot in each of a series of very small circles.

Finger dexterity.—All varieties of pegboard tests are grouped together in this category. In most of these tests the subject picks up small pegs and inserts them in holes. In some, however, he makes a simple assembly such as putting washers on rivets and inserting the assembly into holes. The Purdue Pegboard Test and the O'Conner Finger Dexterity Test are examples.

Hand dexterity.—While these tests involve finger dexterity to some extent, the major purpose is to sample a somewhat larger set of motions involving the wrist. For example, in the Minnesota Turning Test the subject picks up blocks one at a time, turns them over, and replaces them.

Arm dexterity.—The purpose of these tests is to measure a very gross motor dexterity. As with the Minnesota Placing Test, they usually involve the picking up of blocks and the carrying and placing them in another position.

Reaction time.—In this category are included all tests of simple speed of reaction. This and the following type of test, complex reaction, have been used extensively only with operators of motor vehicles.

Complex reaction.—With these tests a number of different types of rapidly changing stimuli are presented to the subject, who must respond differently to the various stimuli. Viteles' "motorman test" is representative of this type.

TESTS OF PERSONALITY TRAITS

Personality.—All personality inventories, regardless of the trait they are presumed to measure, are included in this category. This very broad grouping was necessary because many inventories are not labeled by trait names. Furthermore, many titles involve trait names that are not generally accepted or not commonly used. In many investigations a personality inventory is given to a group of workers and an item analysis is conducted. Items found to be valid are grouped in a final form of the inventory, and the validity of this inventory is determined on the basis of responses of the original group of workers. In this review an attempt was made to eliminate such studies, and to include only those in which cross validation was reported for an independent group or a scoring key was devised on some other basis. The Bernreuter Personality Inventory is typical of the inventories herein dealt with.

Interest.—Inventories of this kind, such as the Strong Vocational Interest Blank, indicate preferences with regard to such topics as avocations, occupations, and school subjects. Not included were studies in which the validity was reported on the basis of scoring keys developed from the experimental group of workers.

Personal data.—Personal data blanks usually consist of a wide variety of questions on the characteristics of the individual and his background: age, sex, marital status, education, occupation, and so on. As with personality and interest inventories, only studies that utilize an independently developed scoring key have been included.

CLASSIFICATION OF CRITERIA OF OCCUPATIONAL SUCCESS

Though occupational success has been gauged in numerous ways, it is possible to differentiate two major types of criteria: those which relate to the capacity of novices to acquire job skill and knowledge, and those which relate to the level of proficiency on the job attained by workers already trained. Examples of training criteria are grades in occupational courses, the passing or failing of such courses, and instructors' ratings of learners. Examples of proficiency criteria are production, supervisors' ratings of job proficiency, sales, and, in certain studies of vehicle operators, accidents.

COMBINATION OF RESULTS FROM DIFFERENT INVESTIGATIONS

The present analysis considers only investigations in which the validities of tests were expressed in terms of the coefficient of correlation between test scores and some criterion measure. While in some studies validity was not expressed in this fashion, the data were so presented that a coefficient of correlation could be computed. Most of the coefficients were Pearsonian coefficients, but some were biserial or tetrachoric. For each type of test applied to each type of job the coefficients for all pertinent studies were assembled. The weighted average of coefficients was computed, utilizing Fisher's z transformation.

SHORTCOMINGS OF THE STUDY

There are many shortcomings in an analysis such as the present, which attempts to summarize, in quantitative fashion, data collected under a wide variety of conditions. Furthermore, little can be said in regard to the dependability of the original data. The results will be useful to the reader only so far as he can convince himself that the shortcomings are relatively unimportant. It is hoped that the errors will be counterbalanced, since in some cases the amount of data is large and the studies are independent. Furthermore, if one is concerned with trends rather than exact determinations, perhaps the shortcomings are of lesser importance.

Difficulties invariably arise whenever things are classified. The attempt was made to classify jobs, tests, and criteria on logical grounds, yet it is probable that many of the bases are purely intuitive. Even an accepted system of classification of jobs such as that provided by the *Dictionary of Occupational Titles* is open to some question. The only justification for the systems of classification used here is that the items could be classified fairly easily and with little disagreement.

The combination of coefficients of correlation obtained from different samples is a much disputed subject. When coefficients of different sorts (e.g., Pearsonian, tetrachoric, and biserial) are combined, the debate is even more emotional. The rigid statistician will deny even the possibility of such a combination. The present analysis utilizes the common procedure of combining coefficients of correlation by obtaining weighted averages through Fisher's z transformation. The adequacy of this procedure may be questioned, for certainly there are differences in the reliability of tests that are placed in the same category, differences in the reliability and validity of criteria, and differences in the range of talents among groups of subjects.

It would be exceedingly difficult if not impossible to carry out the experimental design that most investigators would consider best for determining the occupational validities of tests. To begin with, a battery of well-standardized tests covering all aspects of abilities and traits would be needed. It would be necessary to establish, for every job, reliable and meaningful criteria of occupational success. There would have to be available a large number of persons who form a representative cross section of the total employable population and who could be assigned to any job.

If these basic requirements could be met, then all the tests would be administered to everyone. A large representative sample of the cross section of persons would then be placed on every job, insuring that the persons assigned to each job had the same range of talent. Each person would be trained for the job on which he was placed, and would perform on it for an extended period of years. Criterion measures would be taken at regular intervals. With all these data at hand, validity coefficients for all jobs could be computed for each test. Now tests would be directly comparable with each other and so would jobs, since all measures are highly reliable and all samples of persons are comparable.

The practical difficulties of this experimental design are obvious. Besides being exceedingly costly, there would be many methodological problems not easy to solve. How would we deal with people who fail at their jobs? The rate of failure would be much higher than it is now, since not only do organizations weed out at the time of hiring those who are likely to be inapt, but also there is some self-selection on the part of applicants. What would be done with jobs that change nature and content? The most difficult problem would be to obtain a representative sample of positions for a given job and at the same time secure comparable criterion measures. For example, if one hundred persons were to be placed as machinists, they certainly should not all be in the same organization. There should be positions for machinists in canneries, in metal working shops, in shipyards, and so on. But how would we determine the comparability of the job of machinist in different industrial settings?

These last considerations give substance to the approach used in the present investigation. Suppose we think of each study in the present analysis as a sample. Then, for the most part, we shall be dealing with the average of a series of samples drawn over time and from a variety of organizations widely distributed geographically. In addition we have a sampling of various types of persons and a sampling of investigators. Consequently, any biases that might occur with the ideal experimental design described in the preceding paragraphs would be eliminated or at least minimized, whether the bias was of position, subject, test, organization, geographical locality, time, or investigator.

VARIATION IN FINDINGS

As one looks through reports on the validity of any given type of test applied to workers on some particular job one notices the outstanding characteristic of variability. One author will present a validity coefficient that is quite low; and another author one that is substantial in magnitude. To illustrate this variation, examples drawn from the material collected for the present analysis are shown in figure 1. These cover very different tests and jobs. While in all of them the findings tend to cluster in a particular range of validity, the extent of variation is considerable.

The explanation of this variation is not easy. In some degree it results merely from sampling error, but this alone cannot account for all the variation. It is likely that the crude classification of jobs and tests by types is a factor. Undoubtedly, much of the variation results from differences in the requirements of the same job in different organizations.

TABLE 2

Validity Coefficients of Tests for Supervisory Occupations, General Occupational Classification

Type of test	All supervisory occupations (10)		General supervisors (11)		Foremen (12)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities						
Intelligence	....	.28[c]	....	.36[c]	....	.25[c]
Arithmetic	....	.20[c]	....	.20[a]	....	.20[c]
Spatial perception						
Spatial relations	....	.21[c]	....	....	....	.21[c]
Perception of details						
Cancellation	....	.32[a]	....	.32[a]	....	....
Mechanical comprehension						
Mechanical principles	....	.24[c]	....	....	....	.23[c]
Personality traits						
Personality	.16	.15[c]	.16	.20[b]	....	.15[c]
Interest	....	.16[a]	....	.53	....	.08[a]
Personal data	....	.36[a]	....	.36[a]	....	....

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

VALIDITY OF TESTS FOR JOBS CLASSIFIED ACCORDING TO GENERAL OCCUPATIONAL CLASSIFICATION

The general occupational classification groups jobs in rather broad categories. These in turn are grouped in still broader categories. The first digit of the code number for each job indicates the grossest occupational grouping, and the second digit the finer grouping. In tables 2–7 are given the average validity coefficients for the various types of tests for both types of grouping. The occupational code numbers are given in parentheses following the job titles.

Supervisory Occupations (10)

The average of validity coefficients of tests that have been studied for the selection of supervisors is given in table 2. It will be observed from this table that information is available on relatively few tests.

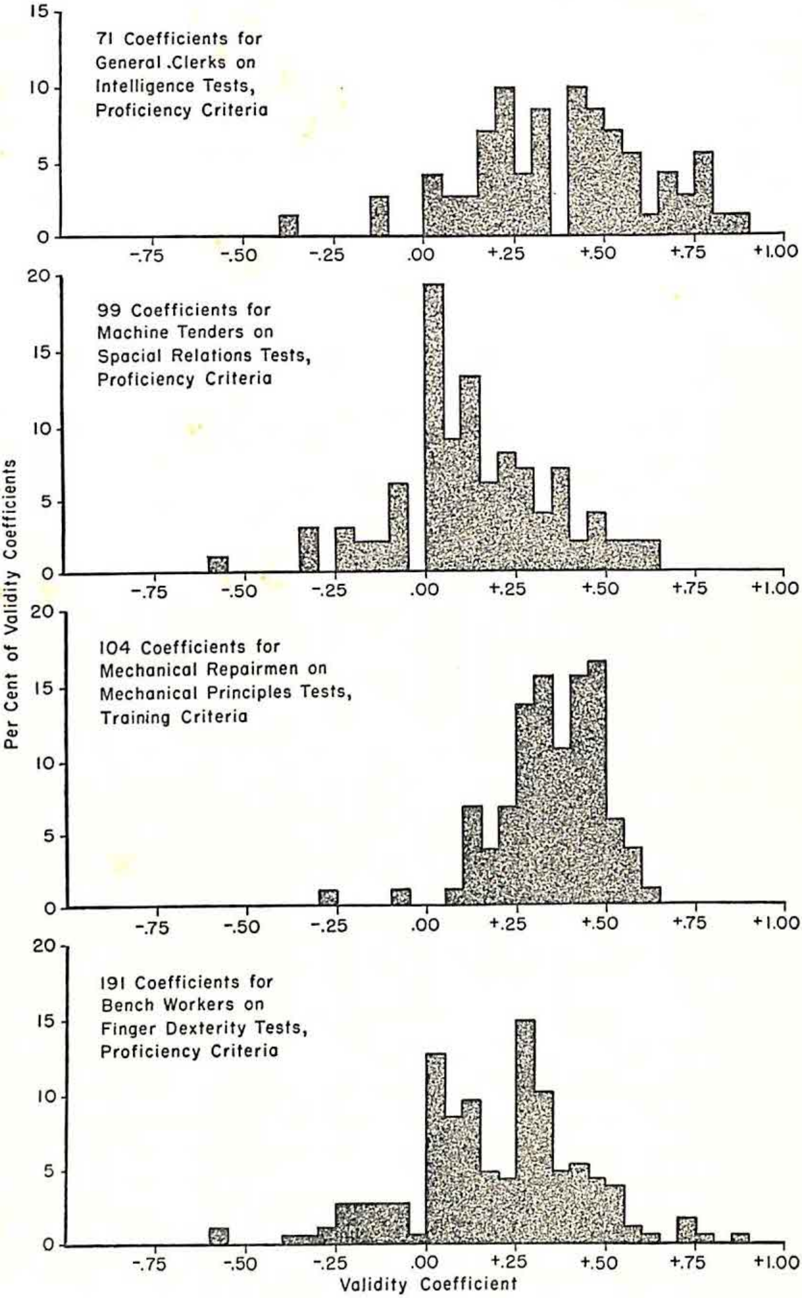

Fig. 1. Examples of variations in the validity of tests for particular jobs.

TABLE 3

VALIDITY COEFFICIENTS OF TESTS FOR CLERICAL OCCUPATIONS,
GENERAL OCCUPATIONAL CLASSIFICATION

Type of test	All clerical occupations (20)		General clerks (21)		Recording clerks (22)		Computing clerks (23)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellect. abilities								
Intelligence.....	.41[c]	.31[c]	.44[c]	.38[c]	.40[c]	.25[c]	.23[a]	.18[c]
Immediate memory......	.32[c]	.30[c]	....	.29[b]	.32[c]	.36[a]	.46	.26[b]
Substitution....	.24[c]	.25[c]	.21[a]	.25[c]	.24[b]	.25[b]	.34[a]	.26[b]
Arithmetic.....	.46[c]	.26[c]	.43[c]	.28[c]	.48[c]	.15[b]	.35[a]	.28[c]
Spatial perception								
Spatial relations	.28[c]	.10[b]	.27[c]	.04[a]	28[c]	—.02[a]	....	.24[a]
Location........	.27[b]	.12[b]	.24[b]	−.03[a]	.49	.11[b]	....	.28[a]
Perception of details								
Number comparison.......	.34[b]	.27[c]	.42	.25[c]	.29[a]	.29[c]	.35[a]	.33[c]
Name comparison...........	.34[b]	.30[c]	.40[a]	.27[c]	.36[a]	.33[b]	.19	.34[c]
Cancellation....	.49[a]	.21[c]	....	.22[b]	.58[a]	.19[c]	.11	.24[c]
Pursuit.........	.21[a]	.12[a]	.21[a]	−.17	....	.12[a]	....	.35[a]
Perceptual speed	.42[c]	.38[a]	....	.38[a]	.42[c]	....	....	....
Mech. comprehen.								
Mech. principles	.24[c]	....	.24[c]	....	.24[c]	....	....	....
Motor abilities								
Tracing.........	.15[a]	.19[a]	....	−.09	.17[a]	.11[a]	.08	.42[a]
Tapping........	.21[b]	.13[b]	....	.10[a]	.23[a]	.15[a]	.16[a]	.14[a]
Dotting........	.13[a]	.13[c]	....	.12[a]	.13[a]	.17[a]	.16	.03[a]
Finger dexterity	.09[b]	.24[c]	....	.29[b]	.09[b]	.25[a]	....	−.11[a]
Hand dexterity .	.30	.11[a]	....	.16[a]	.30	.16	....	−.05
Arm dexterity..	.09	.18[a]	....	.14[a]	.09	−.09	....	.34
Personality traits								
Personality.....	....	.24[c]	....	.29[b]	....	.19[a]	....	.13
Interest........	....	−.02	....	....	....	−.02	....	....
Personal data...	.58[c]	.33[b]	.35[a]	.34[b]	.60[c]	.27[a]	....	....

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

Training criteria.—For only one type of test, personality, has power to predict success in supervisory training been examined, and the validity for it is low.

Proficiency criteria.—For both general supervisors and foremen, intelligence tests give moderately good predictions of proficiency in job performance, but arithmetic and personality tests yield rather low validity. Cancellation tests and personal data blanks are quite useful for general supervisors. Spatial relations and mechanical principles tests show minimal acceptable validity for foremen. Data on measures of interest are sufficiently extensive only for foremen, and for this job they seem to have no value at all.

TABLE 4

VALIDITY COEFFICIENTS OF TESTS FOR SALES OCCUPATIONS, GENERAL OCCUPATIONAL CLASSIFICATION

Type of test	All sales occupations (30)		Sales clerks (31)		Salesmen (32)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities						
Intelligence	....	.02[c]	....	−.10[c]	....	.31[b]
Immediate memory	....	−.08[a]	....	−.08[a]	....	....
Substitution	....	−.16	....	−.16	....	....
Arithmetic	....	.06[a]	....	−.12[a]	....	.41[a]
Perception of details						
Number comparison	....	−.04[a]	....	−.14[a]	....	.22
Name comparison	....	−.15[a]	....	−.15[a]	....	....
Cancellation	....	.02[b]	....	.02[b]	....	....
Personality traits						
Personality	....	.35[c]	....	.35[c]	....	.37[b]
Interest	....	.32[c]	....	.34[b]	....	.31[c]
Personal data	....	.38[c]	....	.35[b]	....	.40[c]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

CLERICAL OCCUPATIONS (20)

A variety of tests have been studied in relation to clerical occupations, and the data for most of these tests are extensive. The validity coefficients for clerical occupations are presented in table 3.

Training criteria.—By and large, both tests of intellectual abilities and of perception of details have substantial and equally high validity for the prediction of trainability of clerical workers. Tests of spatial perception and mechanical comprehension have some, though lesser, usefulness. Tests of motor abilities tend to give poor predictions. Personal data blanks, however, appear to be very promising.

Proficiency criteria.—Reasonably good predictions of the proficiency of clerical workers are given by tests of intellectual abilities and, with one or two exceptions, by tests of the perception of details. Similar results seem to hold for personality inventories and personal data

TABLE 5

VALIDITY COEFFICIENTS OF TESTS FOR PROTECTIVE AND SERVICE OCCUPATIONS AND VEHICLE OPERATORS, GENERAL OCCUPATIONAL CLASSIFICATION

Type of test	Protective occupations (40)		Service occupations (50)		Vehicle operators (60)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities						
Intelligence	.46[a]	.27[c]	.50[b]	.07[a]	.18[c]	.14[c]
Immediate memory	.28[a]	.26[a]	.10[a]	....	....	....
Arithmetic	.30[b]	.15[a]	.59[b]	−.11[a]	.14[c]	.04[a]
Spatial perception						
Spatial relations	.33[a]	.11[a]	.42[b]	....	.21[b]	....
Location	....	....	....	....	....	.18[b]
Perception of details						
Number comparison	....	.19[a]	....	.14[a]	....	....
Name comparison	....	.24[a]	....	−.17[a]	....	....
Cancellation	....	....	....	−.27[a]	....	....
Perceptual speed	.30[a]	....	....	....	.08[b]	....
Mechanical comprehension						
Mechanical principles	.41[a]	.27[a]	....	....	.36[c]	.21[c]
Motor abilities						
Tapping	....	....	....	....	....	.32[a]
Dotting	....	....	....	....	....	.28[a]
Finger dexterity	....	.19[a]	....	....	....	....
Hand dexterity	....	....	....	−.09[a]	....	....
Arm dexterity	....	....	....	−.01[a]	....	....
Reaction time	....	....	....	....	....	.27[a]
Complex reaction	....	....	....	....	....	.35[b]
Personality traits						
Personality	....	.24[b]	....	.16[a]	....	....
Interest	−.09	−.01[a]	....	....	....	.26[a]
Personal data	.35	....	....	....	....	.48[c]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

blanks. Except for computing clerks, for whom they are at least marginally useful, the validity of tests of spatial perception is essentially zero.

SALES OCCUPATIONS (30)

The validity coefficients for tests used in the prediction of success in sales occupations are listed in table 4. Information is available only for tests of intellectual abilities, perception of details, and personality traits.

Training criteria.—In the review of the literature no studies of the effectiveness of tests for the prediction of trainability in sales occupations were found.

Proficiency criteria.—From the information available it appears that the traits important for success are very different for sales clerks and for salesmen. The former are usually considered as being lower occupationally than the latter. The validity coefficients of tests of intellectual abilities and of perception of details are uniformly low and negative for sales clerks, whereas they are positive for salesmen, and, in intelligence and arithmetic tests, fairly high. For both types of sales jobs, personality and interest inventories and personal data blanks are quite useful.

PROTECTIVE OCCUPATIONS (40)

Table 5 gives test validities for the protective occupations.

Training criteria.—It seems clear that tests of intellectual abilities, and particularly intelligence tests, are useful for selecting trainees for the protective occupations. Tests of spatial relations, perceptual speed, and mechanical principles are equally effective.

Proficiency criteria.—As indicators of ability to perform the job, intelligence, immediate memory, and mechanical principles tests are fairly good. Tests of spatial relations, perception of details, and finger dexterity are less useful. Personality inventories give at least marginally useful predictions of job success, but interest inventories have proved completely ineffective.

SERVICE OCCUPATIONS (50)

The data for service occupations are presented in table 5.

Training criteria.—Intelligence, arithmetic, and spatial relations tests have strikingly high validity coefficients for the prediction of success in training in service occupations. Immediate memory tests contribute little to such predictions.

Proficiency criteria.—On all types of tests for which there is evidence, intellectual abilities, perception of details, motor abilities, and personality, validity coefficients for proficiency among service workers cluster around zero. It would appear, therefore, that none of the devices thus far investigated has any value in predicting proficiency in service occupations.

VEHICLE OPERATORS (60)

Table 5 presents the validity coefficients of tests for vehicle operators.

Training criteria.—Only one test, mechanical principles, gives a substantial prediction of trainability in the operation of vehicles. Spatial relations tests have slight promise, but intelligence, arithmetic, and perceptual speed tests have been found to be of little value.

Proficiency criteria.—Personal data blanks are by far the best devices for the selection of operators of motor vehicles. Tests of mechanical comprehension, tapping, dotting, interest, and simple and complex reaction time have fair to moderate usefulness. Intelligence, arithmetic, and location tests have little or no value.

TRADES AND CRAFTS (70)

As may be seen in table 6, there is a wealth of data on the effectiveness of tests in trades and crafts.

Training criteria.—Of substantial and about equally good value in the selection of trainees for trades and crafts are tests of intellectual abilities, spatial perception, and mechanical comprehension. For the most part, motor tests are not of much use. Tests of perception of details have varying utility; perceptual speed tests are very good; cancellation tests are of considerably lesser value; and the remaining types contribute very little toward prediction. Personal data blanks seem to be fairly good.

Proficiency criteria.—With the exception of mechanical comprehension tests and personal data blanks, which have substantial validities, all types of tests offer rather modest prospects of success in the prediction of proficiency in trades and crafts.

INDUSTRIAL OCCUPATIONS (80)

While extensive, information on the effectiveness of tests for industrial occupations is not so great as that for trades and crafts. The available data are given in table 7.

Training criteria.—The validity coefficients for training criteria vary considerably for the same type of test. Intelligence tests have little value, while arithmetic tests seem to be good. Similarly, among the measures of motor ability, tests of finger, hand, and arm dexterity are quite good, while those of tracing, tapping, and dotting have low validity coefficients. Tests of spatial relations and of perceptual speed have minimally acceptable validity.

Proficiency criteria.—Data on the prediction of proficiency in industrial occupations are extensive, and all types of tests but those designed to measure personality traits are well covered. With few exceptions the validity coefficients of all types of tests are uniformly low, being of the order of .16. Moderately good predictions are given by cancellation and perceptual speed tests, and very good prediction is given by tests of mechanical principles.

TABLE 6

VALIDITY COEFFICIENTS OF TESTS FOR TRADES AND CRAFTS, GENERAL OCCUPATIONAL CLASSIFICATION

Type of test	All trades and crafts (70)		Mechanical repairmen (71)		Electrical workers (72)		Structural workers (73)		Processing workers (74)		Complex machine operators (75)		Machining workers (76)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities														
Intelligence........	.38[c]	.20[c]	.38[c]	.18[b]	.43[c]	.47[a]	.29[c]	.09[a]	.35[c]	.24[a]	.34[c]	.28[a]	.30[c]	.08[b]
Immediate memory	.28[c]	.17[b]	.30[c]	....	.31[b]	.21	.13[b]	.13[a]	.31[a]	.15[a]	.12[a]	.30[a]	...	−.02[a]
Substitution.......	.31[b]	.21[a]	.34	...	.34	−.17	.31[b]	.31	...	.34	...	.26[a]	.27[a]	.21[a]
Arithmetic........	.39[c]	.23[c]	.40[c]	.27[a]	.45[c]	.07	.30[c]	.15[a]	.35[c]	.02	−.08	.29[a]	.33[c]	.20[a]
Spatial perception														
Spatial relations...	.33[c]	.19[c]	.34[c]	.22[a]	.33[c]	.33[a]	.28[c]	.31[a]	.35[c]	.16[a]	.36[c]	.30[b]	.33[c]	.11[c]
Location..........	.24[c]	.19[c]	.24[b]	.07	.24	.23[a]	.23[b]	.23[a]	.24	.21[a]	.28	.25[a]	.24[a]	.04[a]
Perception of details														
Number comparison	.16[a]	.14[b]	.22	.23	.16	.17	−.04[a]	.08[a]	.24[a]	.21	.42	.14[a]	.02[a]	.12
Name comparison..	.09[a]	.20[a]	...	.53	.09	.13	−.01[a]	.08	.14[a]	.20	.57	.22[a]	−.02[a]	.25
Cancellation.......	.24[b]	.16[a]	...	.04	...	.21	...	.21	...	...	.20[a]	.23	.28[a]	...
Pursuit............	.15[b]	.24[b]	.17[b]	.50	.12[a]	.32	.18	.24	−.13	.17[a]	.41	.33[a]	.19	.01[a]
Perceptual speed...	.40[c]	.24[b]	.40[c]	.03	.43[b]	.36	.29[c]	.35[a]	.34[b]	.19[a]	...	.28	.35[b]	−.12
Mech. comprehension														
Mech. principles...	.37[c]	.40[b]	.37[c]	.35[a]	.40[c]	...	.31[c]	.14	.40[b]	...	...	.40[a]	.33[c]	.57[a]
Motor abilities														
Tracing...........	.22[c]	.19[b]	.21[a]	.27	.24[a]	.15	.24	.30[a]	.17[a]	.24[a]	.22	.19[a]	.21[a]	.06[a]
Tapping...........	.05[b]	.17[b]	−.01[a]	.21	−.11	.19	.20[a]	.18[a]	−.01[a]	.39	.24	.19[a]	.05[a]	.08[a]
Dotting...........	.14[b]	.11[b]	.20[a]	.11	−.14	.01	.13[a]	.20[a]	.02[a]	...	.26	.11[a]	.14[a]	.06[a]
Finger dexterity...	.19[c]	.20[c]	.19[b]	.17[a]	.15[c]	.18[a]	.24[b]	.30[a]	.22[b]	.30[b]	.11	.14[c]	.24[b]	.08[c]
Hand dexterity....	.17[a]	.22[a]	.17	.12[a]	−.38	...	...	.24	...	...	.40	.46	...	.29[a]
Arm dexterity.....	.06[a]	.15[b]	.08	.07	−.10	...	...	.24	...	.32	.34	.33	−.03[a]	.11[a]
Personality traits														
Personality........	...	.28[a]	...	...	...	...	...	...	...	.30[a]	...	.24[a]	...	...
Interest...........	.34	−.13	.37	...	...	...	...	...	...	...	.31	...	...	−.13
Personal data......	.34[c]	.52[a]	.37[c]	.48[a]	.32[a]	...	.29[b]	...	...	.58[a]	...	...	.32[b]	...

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

TABLE 7

Validity Coefficients of Tests for Industrial Occupations, General Occupational Classification

Type of test	All industrial occupations (80)		Machine tenders (81)		Bench workers and assemblers (82)		Inspectors (83)		Packers and wrappers (84)		Gross manual workers (85)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities												
Intelligence	.15[c]	.20[c]	−.31	.16[c]	.02[a]	.22[c]	.19[b]	.35[b]	.22[b]	.13[b]	−.03[a]	.26[b]
Immediate memory	...	.15[c]	...	.17[c]	...	.06[c]	...	.14[a]	...	.24[a]	...	...
Substitution	...	.14[c]	...	.19[b]	...	.12[c]	...	−.01	...	.16[a]	...	...
Arithmetic	.41[b]	.13[c]	...	.15[c]	.39[a]	.09[b]	.27	.18[a]	.43[b]	.14[a]	...	...
Spatial perception												
Spatial relations	.24[c]	.14[c]	...	.11[c]	.24[b]	.15[c]	.27[c]	.24[b]	.22[a]	.13[b]	...	.35
Location	.22[b]	.15[c]	...	.11[c]	.29[a]	.19[c]	.19[b]	.18[b]	...	.16[b]	...	...
Perception of details												
Number comparison	...	.16[c]	...	.20[c]	...	.15[c]	...	−.02[a]	...	.13[c]	...	...
Name comparison	...	.16[c]	...	.17[c]	...	.10[c]	...	.17[a]	...	.20[c]	...	...
Cancellation	...	.31[c]	...	.25[a]	...	.36[b]	...	−.11	...	.24[a]	...	...
Pursuit	.15[a]	.14[c]	...	.15[c]	.28[a]	.15[c]	.09[a]	.09[a]	...	.16[a]	...	...
Perceptual speed	.24[c]	.27[c]	...	.31	.26[a]	.27[c]	.12[b]	...	...	...	...	...
Mechanical comprehension												
Mechanical principles	...	.50[a]	...	...	...	.56[a]	...	.42[a]	...	...	...	...
Motor abilities												
Tracing	.14[a]	.17[c]	...	.16[c]	.16[a]	.18[c]	.09	.20[a]	...	.12[a]	...	...
Tapping	.11[a]	.12[c]	...	.12[c]	.16[a]	.14[c]	.10[a]	.06[a]	...	.14[a]	...	...
Dotting	.17[a]	.15[c]	...	.15[c]	.22[a]	.15[c]	.08	.06[a]	...	.13[a]	...	...
Finger dexterity	.38[c]	.18[c]	.21	.15[c]	.44[c]	.25[c]	.00[a]	.14[c]	...	.08[c]	...	.15[a]
Hand dexterity	.50[a]	.15[c]	...	.23[a]	.50[a]	.14[a]	...	−.02[a]	...	.15[c]	...	...
Arm dexterity	.54[a]	.21[c]	...	.15[b]	.54[a]	.24[b]	...	.00[c]	...	.24[c]	...	.43[a]
Personality traits												
Personality	...	.50	...	...	...	.50	...	...	...	...	...	...
Interest	.26	.02	...	.26	...	.02	...	...	...	...	...	...
Personal data	...	.38	...	...	...	.38	...	...	...	...	...	...

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

VALIDITY OF TESTS FOR JOBS CLASSIFIED ACCORDING TO DICTIONARY OF OCCUPATIONAL TITLES

The *Dictionary of Occupational Titles* codifies and organizes jobs into families by means of a series of code numbers containing five or six digits. The first digit gives the most general grouping, the next two a finer breakdown, and the last two or three the most specific job designation. Since with the most specific designations of five and six digits there are well over 60,000 jobs, the present investigation deals with only the two grosser classifications. In Appendix A are given the average validity coefficients for jobs classified in terms of the first three digits of the occupational code number. The following discussion will be concerned with the breakdown in terms of the first digit. The only departures from this procedure will be for clerical and sales occupations which have the same first digit in their code numbers, and for the various service occupations which also have the same first digit. In both of these categories, breakdowns to the second digit of the code number will be made. Tables 8–12 present the validity coefficients for this grosser classification of jobs.

TABLE 8

VALIDITY COEFFICIENTS OF TESTS FOR MANAGERIAL AND OFFICIAL OCCUPATIONS, DICTIONARY OF OCCUPATIONAL TITLES

Type of test	Managerial and official occupations (0-7 to 0-9)	
	Train.	Prof.
Intellectual abilities		
Intelligence	.41	.37[c]
Arithmetic	...	.20[a]
Perception of details		
Cancellation	...	.32[a]
Personality traits		
Personality	.16	.18[b]
Interest	...	.53
Personal data	...	.36[a]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

MANAGERIAL AND OFFICIAL OCCUPATIONS (0-)

The data available for test validity in managerial and official occupations are shown in table 8.

TABLE 9

VALIDITY COEFFICIENTS OF TESTS FOR CLERICAL AND SALES OCCUPATIONS, DICTIONARY OF OCCUPATIONAL TITLES

Type of test	Clerical and kindred occupations (1-0 to 1-4)		Sales and kindred occupations (1-5 to 1-9)	
	Train.	Prof.	Train.	Prof.
Intellectual abilities				
Intelligence	.40[c]	.31[c]	....	.02[c]
Immediate memory	.33[c]	.30[c]	....	−.08[a]
Substitution	.24[c]	.27[c]	....	−.16
Arithmetic	.46[c]	.31[c]	....	.06[a]
Spatial perception				
Spatial relations	.28[c]	.06[b]	....	....
Location	.27[b]	.12[b]	....	....
Perception of details				
Number comparison	.34[b]	.28[c]	....	−.05[a]
Name comparison	.36[b]	.31[c]	....	−.15[a]
Cancellation	.49[a]	.21[c]	....	.02[b]
Pursuit	.22[a]	.12[a]	....	....
Perceptual speed	.42[c]	.06	....	....
Mechanical comprehension				
Mechanical principles	.24[c]	....	....	....
Motor abilities				
Tracing	.15[a]	.16[a]	....	....
Tapping	.21[b]	.13[b]	....	....
Dotting	.13[a]	.11[c]	....	....
Finger dexterity	.09[b]	.23[c]	....	....
Hand dexterity	.30	.12[a]	....	....
Arm dexterity	.09	.16[a]	....	....
Personality traits				
Personality	....	.24[c]	....	.36[c]
Interest	....	−.02	....	.32[c]
Personal data	.56[c]	.33[b]	....	.45[c]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

Training criteria.—No significant data have been collected for training criteria.

Proficiency criteria.—For these occupations, intelligence and cancellation tests together with personal data blanks are quite good. Arithmetic and personality tests are of lesser and very limited value.

CLERICAL OCCUPATIONS (1-0 to 1-4)

A wealth of data relative to the predictive power of tests is available for clerical occupations. These are shown in table 9.

TABLE 10

VALIDITY COEFFICIENTS OF TESTS FOR SERVICE OCCUPATIONS, DICTIONARY OF OCCUPATIONAL TITLES

Type of test	Domestic service occupations (2-0)		Personal service occupations (2-2 to 2-5)		Protective service occupations (2-6)		Building service workers and porters (2-8, 2-9)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities								
Intelligence	...	...	.61^{b}	.07^{a}	.46^{a}	.27^{c}	...	.65
Immediate memory	−.31	...	...	...	.28^{a}	.26^{a}	...	...
Arithmetic	.54^{b}	...	...	−.11^{a}	.30^{b}	.15^{a}	...	...
Spatial perception								
Spatial relations	.42^{b}	...	...	...	.33^{a}	.11^{a}	...	.35
Perception of details								
Number comparison	...	...	...	.14^{a}	...	.25^{a}	...	...
Name comparison	...	...	...	−.17^{a}	...	.36^{a}	...	...
Cancellation	...	...	...	−.27^{a}	...	...	...	...
Perceptual speed	...	...	...	...	.30^{a}	...	...	...
Mechanical comprehension								
Mechanical principles	...	...	...	...	.41^{a}	.27^{a}	...	...
Motor abilities								
Dotting	...	...	...	...	...	...	...	...
Finger dexterity	...	...	...	...	...	.19^{a}	...	...
Hand dexterity	...	...	...	−.09^{a}	...	...	...	...
Arm dexterity	...	...	...	−.01^{a}	...	...	...	...
Personality traits								
Personality	...	...	...	.16^{a}	...	.24^{b}	...	...
Interest	...	...	...	−.01^{a}	−.09	...	...	...
Personal data	...	...	...	...	.35	...	...	...

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

Training criteria.—All types of tests, with the exception of motor tests, give moderate to good predictions of trainability of office workers. Tests of intellectual abilities and of perception of details are especially effective. Tests of spatial perception and mechanical comprehension have more value than might be anticipated. Personal data blanks seem to be especially useful.

Proficiency criteria.—Intellectual tests give modest, though consistently the best, prediction of the proficiency of clerical workers. Two measures of perception of details, name and number comparison, are just about as good, but most other such tests have little or no value. Spatial perception and motor abilities tests have uniformly low validities. Personality inventories and personal data blanks are of moderate value.

SALES OCCUPATIONS (1-5 to 1-9)

The validity coefficients of tests for all sales occupations grouped together are listed in table 9.

Training criteria.—No studies of the selection of trainees in sales occupations were found.

Proficiency criteria.—Information concerning the effectiveness of tests in the prediction of proficiency in sales occupations is restricted to three types of tests. For sales occupations as a whole, the validity coefficients of tests of intellectual abilities and perception of details cluster around a value of zero. Personality and interest inventories and personal data blanks, however, give substantial predictions.

DOMESTIC SERVICE OCCUPATIONS (2-0)

Very little information is available for domestic service occupations. The available data are given in table 10.

Training criteria.—For only two tests, arithmetic and spatial relations, is there a sufficient amount of information on which conclusions may be drawn. Both of these tests, however, do give excellent predictions.

Proficiency criteria.—No data are available on the effectiveness of tests in the prediction of proficiency in domestic service occupations.

PERSONAL SERVICE OCCUPATIONS (2-2 to 2-5)

Information on the validities of tests for personal service occupations is given in table 10.

Training criteria.—The only data available in this area are for intelligence tests, and these give excellent predictions.

Proficiency criteria.—For personal service occupations a scattering of validity coefficients is found for tests of intellectual abilities, perception of details, motor abilities, and personality traits. All these coefficients cluster around a value of zero.

TABLE 11

VALIDITY COEFFICIENTS OF TESTS FOR AGRICULTURAL, FISHERY, FORESTRY, AND KINDRED OCCUPATIONS, DICTIONARY OF OCCUPATIONAL TITLES

Type of test	Agricultural, horticultural, and kindred occupations (3-0 to 3-4)	
	Train.	Prof.
Intellectual abilities		
Intelligence	.05	.00
Substitution	....	−.04
Spatial perception		
Spatial relations	....	−.02
Location	....	.11
Perception of details		
Number comparison	....	.08
Pursuit	....	.09
Motor abilities		
Tapping	....	.35
Finger dexterity	....	.10[a]
Arm dexterity	....	.55[a]

[a] 100 to 499 cases.

PROTECTIVE SERVICE OCCUPATIONS (2-6)

Table 10 lists the validity coefficients for the protective service occupations.

Training criteria.—Tests of intellectual abilities, spatial perception, perception of details, and mechanical comprehension all have at least moderately good validity coefficients. Of especial value are intelligence and mechanical principles tests.

Proficiency criteria.—Intellectual abilities tests, except arithmetic tests, and tests of perception of details, mechanical principles, and personality give at least moderately good predictions of proficiency in the protective service occupations. Spatial relations and finger dexterity tests have low validity.

BUILDING SERVICE WORKERS AND PORTERS (2-8 to 2-9)

As will be seen in table 10, the information concerning this occupation is insufficient to warrant conclusions on the effectiveness of the tests.

TABLE 12

VALIDITY COEFFICIENTS OF TESTS FOR SKILLED, SEMISKILLED, AND UNSKILLED OCCUPATIONS, DICTIONARY OF OCCUPATIONAL TITLES

Type of test	Skilled occupations (4, 5)		Semiskilled occupations (6, 7)		Unskilled occupations (8, 9)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities						
Intelligence	.38[c]	.21[c]	.20[c]	.23[c]	−.11	.02[c]
Immediate memory	.28[c]	.19[a]	.05[b]	.14[c]	....	.16[b]
Substitution	.30[b]	.17[b]	.34	.15[c]	....	.21[b]
Arithmetic	.40[c]	.20[c]	.25[c]	.16[c]	....	.04[b]
Spatial perception						
Spatial relations	.33[c]	.23[c]	.21[c]	.14[c]	.45	.12[c]
Location	.23[c]	.16[c]	.28	.15[c]	....	.16[c]
Perception of details						
Number comparison	.17[a]	.16[b]	.06	.16[c]	....	.13[c]
Name comparison	.10[a]	.21[a]	.03	.15[c]	....	.17[c]
Cancellation	.24[b]	.22[a]	....	.34[b]	....	.28[a]
Pursuit	.15[c]	.21[b]	....	.16[c]	....	.10[b]
Perceptual speed	.54[c]	.01[c]	.13[b]	.30[c]	....	.27[b]
Mechanical comprehension						
Mechanical principles	.37[c]	.26[c]	.34[c]	.26[c]	.44	....
Motor abilities						
Tracing	.22[c]	.14[b]	....	.18[c]	....	.15[b]
Tapping	.07[c]	.22[b]	.09	.13[c]	....	.11[b]
Dotting	.15[b]	.12[b]	....	.17[c]	....	.11[c]
Finger dexterity	.17[c]	.14[c]	.52[c]	.23[c]	....	.17[c]
Hand dexterity	.39[a]	.23[a]	....	.18[b]	....	.14[c]
Arm dexterity	.06[a]	.16[b]	.54[a]	.12[c]	....	.21[c]
Personality traits						
Personality	....	.15[c]	....	.31[a]	....	....
Interest	.31	.01[a]	....	.26[a]	.37	.26
Personal data	.34[c]	.45[a]	....	.49[c]	....	....

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

AGRICULTURAL, FISHERY, FORESTRY, AND KINDRED OCCUPATIONS (3-)

The limited information that has been obtained for these occupations is presented in table 11.

Training criteria.—In view of the paucity of data, no conclusions on the usefulness of tests in the prediction of trainability are justified.

Proficiency criteria.—Arm dexterity tests appear to be of outstanding usefulness in the prediction of proficiency, but finger dexterity tests have low validity. For the other types of tests the data are too few to indicate trends.

SKILLED (4– AND 5–), SEMISKILLED (6– AND 7–), AND UNSKILLED (8– AND 9–) OCCUPATIONS

Skilled, semiskilled, and unskilled occupations constitute what is commonly termed the industrial occupations. As will be seen in table 12, there is a wealth of data concerning these occupations, particularly with respect to proficiency criteria.

Training criteria.—Intellectual tests have high or moderately high validity coefficients for skilled occupations, and moderate or low ones for semiskilled occupations. The validity of spatial relations tests, too, seems to be somewhat higher for skilled than for semiskilled occupations. With the exception of tests of perceptual speed, measures of perception of details have low validity for skilled occupations. For only one test of this type, perceptual speed, is there any significant amount of information for semiskilled occupations, and for this type of test the validity is low. Mechanical comprehension tests have fairly high validity for both skilled and semiskilled occupations. With the exception of hand dexterity tests, which have high validity, the predictive power of motor abilities tests for skilled occupations is generally low. In semiskilled occupations there is information on only two motor tests, finger dexterity and arm dexterity; both have rather high validity coefficients. In the personality area all that can be said is that personal data blanks have fairly good validity in skilled occupations. Owing to the insufficiency of data, no conclusions can be drawn in regard to the predictive power of tests for unskilled occupations.

Proficiency criteria.—For all three levels of skill, tests of intellectual abilities have low validity for proficiency criteria. In general, the coefficients seem to be highest for skilled and lowest for unskilled occupations. Tests of perception of details uniformly have low validity for skilled occupations. Two of these tests, cancellation and perceptual speed, have moderately good predictive power for both semiskilled and unskilled occupations, but the rest are of little value. Personality and interest inventories have moderately good validity coefficients for semiskilled occupations, but are of no value for skilled occupations. Personal data blanks yield very substantial validity coefficients for both occupations. In the absence of data no conclusions can be drawn concerning the effectiveness of personality traits in unskilled occupations.

VALIDITY OF TESTS FOR JOBS CLASSIFIED ACCORDING TO ENTRY OCCUPATIONAL CLASSIFICATION

The entry occupational classification attempts to group jobs in terms of the nature of the work involved. The grouping of jobs into families is indicated by the code number. The first digit is indicative of the grossest grouping, the second digit gives a finer grouping, and the last digit or digits still finer groupings. The average validity coefficients of the tests for the finest groupings of jobs used here are given in Appendix B. Tables 13–17 present the coefficients for jobs grouped in terms of the two grosser levels of classification.

TABLE 13

Validity Coefficients of Tests for Public Service and Managerial Work, Entry Occupations

Type of test	All public service and managerial work (0-X)		Public service work (0-X6)		Managerial work (0-X8)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities						
Intelligence	.46[a]	.28[c]	.46[a]	.27[c]	....	.28[c]
Immediate memory	.28[a]	.26[a]	.28[a]	.26[a]	....	....
Arithmetic	.30[b]	.19[c]	.30[b]	.15[a]	....	.20[c]
Spatial perception						
Spatial relations	....	.20[c]	....	.11[a]	....	.21[c]
Perception of details						
Number comparison	....	.25[a]	....	.25[a]	....	....
Name comparison	....	.24[a]	....	.24[a]	....	....
Cancellation	....	.32[a]	....	....	....	.32[a]
Pursuit	.33[a]	....	.33[a]	....	....	....
Perceptual speed	.30[a]	....	.30[a]	....	....	....
Mechanical comprehension						
Mechanical principles	.41[a]	.12[c]	.41[a]	.27[c]	....	.11[c]
Motor abilities						
Finger dexterity	....	.19[a]	....	.19[a]	....	....
Personality traits						
Personality	.16	.16[c]	.16	.24[b]	....	.15[c]
Interest	−.09	.10[a]	−.09	−.01[a]	....	.16[a]
Personal data	.35	.36[a]	.35	....	....	.36[a]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

Public Service and Managerial Work (0-x)

Table 13 presents the validity data for the two major groups of jobs in this classification for which data were collected.

Training criteria.—Tests of intellectual abilities, perception of details, and mechanical comprehension all yield very good predictions of

TABLE 14

Validity Coefficients of Tests for Clerical and Sales Work, Entry Occupations

Type of test	All clerical and sales work (1-X)		Computing work (1-X1)		Recording work (1-X2)		General clerical work (1-X4)		Public contact work (1-X5)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities										
Intelligence	.41[c]	.25[c]	.42	.19[b]	.41[c]	.28[c]	.40[c]	.40[c]	...	.21[c]
Immediate memory	.33[c]	.26[c]	...	.34[a]	.33[c]	.27[b]	...	.33[b]	...	−.08[a]
Substitution	.24[c]	.25[c]	.22	.36[a]	.25[b]	.23[c]	.21[a]	.28[c]	...	−.16
Arithmetic	.45[c]	.26[c]	.36	.34[b]	.48[c]	.20[c]	.40[c]	.36[c]	...	.06[a]
Spatial perception										
Spatial relations	.28[b]	.10[b]	...	.37	.28[c]	.07[b]	.27[c]	.40[a]	...	...
Location	.27[b]	.13[b]	.49	.34[a]	.25[b]	.11[b]	...	−.03[a]	...	...
Perception of details										
Number comparison	.34[b]	.25[c]	.29	.35[a]	.34[b]	.28[c]	.42	.24[c]	...	−.05[a]
Name comparison	.36[b]	.27[c]	.34[a]	.38[a]	.41[a]	.34[c]	...	.24[c]	...	−.15[a]
Cancellation	.49[a]	.17[c]	.11	.26[a]	.58[a]	.20[c]	...	.25[a]	...	.02[b]
Pursuit	.22[a]	.12[a]	...	.42	.22[a]	.12[a]	...	−.17	...	...
Perceptual speed	.42[c]	.38[a]	...	...	.43[c]	.42[a]	.31[b]	.06	...	...
Mechanical comprehension										
Mechanical principles	.24[c]	...	...	...	.26[c]	...	.21[c]	...	...	...
Motor abilities										
Tracing	.15[a]	.16[a]	.08	.44	.16[a]	.14[a]	...	−.09	...	...
Tapping	.22[b]	.17[b]	.24[a]	.16[a]	.21[a]	.18[b]	...	.07[a]	...	...
Dotting	.12[a]	.13[c]	...	.11[a]	.12[a]	.14[c]	...	.00[a]	...	...
Finger dexterity	.07[b]	.23[c]	...	...	.07[b]	.18[a]	...	.26[b]	...	...
Hand dexterity	.30	.12[a]	...	...	.30	−.03[a]	...	.18[a]	...	...
Arm dexterity	.09	.16[a]	...	...	.09	.08	...	.18[a]	...	...
Personality traits										
Personality	...	.33[c]	...	.13	...	.18[b]	...	.40[a]	...	.36[c]
Interest	...	.31[c]	...	...	...	−.02	...	...	...	.32[c]
Personal data	.58[c]	.43[c]	...	...	.58[c]	.31[a]	...	.34[a]	...	.45[c]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

trainability in this occupation. Little or no information is available for the other types of tests.

Proficiency criteria.—In the prediction of proficiency, tests of intellectual ability and perception of details have fair validity. For tests of spatial relations, mechanical principles, and finger dexterity the validity is low. Personality and interest inventories have little value, but personal data blanks have substantial value.

TABLE 15

VALIDITY COEFFICIENTS OF TESTS FOR SERVICE WORK AND AGRICULTURAL WORK, ENTRY OCCUPATIONS

Type of test	Service work (2-X)		Agricultural work (3-X)	
	Train.	Prof.	Train.	Prof.
Intellectual abilities				
Intelligence	.50[b]	.24[c]	.05	....
Arithmetic	.59[b]	.00[a]	....	....
Spatial perception				
Spatial relations	.42[b]	.35	....	....
Location	....	.20[a]	....	....
Perception of details				
Number comparison	....	.14[a]	....	....
Name comparison	....	−.17[a]	....	....
Cancellation	....	−.27[a]	....	....
Mechanical comprehension				
Mechanical principles	....	.03[a]	....	....
Motor abilities				
Tracing	....	....	....	....
Tapping	....	.17[a]	....	....
Dotting	....	.17[a]	....	....
Finger dexterity	....	.07[a]	....	....
Hand dexterity	....	−.09[a]	....	....
Arm dexterity	....	−.01[a]	....	....
Personality traits				
Personality	....	.16[a]	....	....
Interest	....	.25[a]	....	....

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

CLERICAL AND SALES WORK (1-x)

As will be seen in table 14, considerable evidence is available concerning the validity of tests for most of these occupations.

Training criteria.—For clerical and sales occupations taken as a whole, tests of intellectual abilities and perception of details in general

TABLE 16

VALIDITY COEFFICIENTS OF TESTS FOR MECHANICAL WORK, ENTRY OCCUPATIONS

Type of test	All mechanical work (4-X)		Machine trades (4-X2)		Crafts (4-X6)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intelligence abilities						
Intelligence	.38 c	.20 c	.37 c	.14 c	.39 c	.40 b
Immediate memory	.27 c	.18 b	.29 c	.20 a	.22 c	.14 a
Substitution	.30 b	.17 a	.29 a	.24 a	.31 b	.08 a
Arithmetic	.39 c	.22 c	.40 c	.24 b	.38 c	.09 a
Spatial perception						
Spatial relations	.33 c	.21 c	.34 c	.15 c	.31 c	.37 b
Location	.23 c	.18 c	.23 c	.16 c	.24 b	.22 b
Perception of details						
Number comparison	.16 a	.13 a	.09 a	.17 a	.20 a	.08 a
Name comparison	.10 a	.19 a	−.02 a	.27 a	.16 a	.03 a
Cancellation	.24 b	.11 a	.24 b	.12 a	....	.10 a
Pursuit	.15 c	.23 b	.16 b	.25 a	.13 a	.21 a
Perceptual speed	.38 c	−.02 a	.40 c	−.03 a	.32 c	.00
Mechanical comprehension						
Mechanical principles	.37 c	.37 b	.37 c	.34 b	.38 c	.55 a
Motor abilities						
Tracing	.15 c	.13 b	.09 b	.12 a	.23 b	.14 a
Tapping	.07 c	.20 b	.06 b	.21 b	.11 a	.19 a
Dotting	.15 b	.09 c	.18 b	.08 b	.10 a	.10 a
Finger dexterity	.23 c	.16 c	.20 c	.12 c	.24 c	.23 c
Hand dexterity	.39 a	.21 a	.17	.22 a	.44 a	.20
Arm dexterity	.30 a	.16 b	.01 a	.09 a	.48 a	.22 a
Personality traits						
Personality	....	.24 a	....	.24	....	....
Interest	.34	−.13	.37	−.13	.31	....
Personal data	.31 c	.46 c	.32 b	.46 c	.30 c	....

Less than 100 cases, no letter symbol.
a 100 to 499 cases. b 500 to 999 cases. c 1,000 or more cases.

have substantial and equally good validity coefficients. Tests of spatial relations and mechanical principles have moderate predictive power, and the validity of motor abilities tests tends to be low. Personal data blanks have exceptionally good validity.

Proficiency criteria.—For this broad occupational group, intellectual tests and most of the tests of perception of details give fair prediction of proficiency. Spatial relations and motor tests have low validity. All measures of personality traits have at least moderately high validity.

Service Work (2-x)

The validity coefficients of tests that have been studied in service occupations are listed in table 15.

Training criteria.—For only three tests, intelligence, arithmetic, and spatial relations, are data available on the prediction of training for service work. All these tests have high validity.

Proficiency criteria.—The data are inconsistent for tests of intellectual abilities. Intelligence tests have fair validity, but the validity of arithmetic tests is zero. Location and mechanical principles tests and measures of personality have little or no value. The validity coefficients of tests of perception of details and motor abilities cluster around zero.

Mechanical Work (4-X)

For mechanical work, data are available for almost every type of test for both training and proficiency criteria. The individual coefficients are presented in table 16.

Training criteria.—All tests of intellectual abilities and tests of mechanical comprehension have substantial validity in the prediction of trainability for mechanical work. Tests of spatial perception are almost as good for this purpose. Tests of perception of details have low validity. One exception is the test of perceptual speed, for which validity is fairly high. Arm and hand dexterity tests have good validity, but predictive power is negligible for the other tests of motor abilities. Personal data blanks seem promising.

Proficiency criteria.—Mechanical comprehension tests and personal data blanks have very good validity for proficiency criteria. Tests of intellectual abilities, spatial perception, perception of details, and motor abilities have low or negligible validity.

Manual Work (6-X)

Validity coefficients of the various types of tests for the prediction of success in manual work are given in table 17.

Training criteria.—The validity of intellectual abilities and spatial relations tests for this purpose is modest. Mechanical comprehension and finger dexterity tests give the best predictions. The validity of perceptual speed tests is low.

Proficiency criteria.—With a few exceptions, validity coefficients of all types of tests are low. Moderately high or high validity appears characteristic of cancellation, speed of perception, and mechanical principles tests and of personality and personal data questionnaires.

TABLE 17

Validity Coefficients of Tests for Manual Work, Entry Occupations

Type of test	All manual work (6-X)		Observational work (6-X2)		Manipulative work (6-X4)		Elemental work (6-X6)	
	Train.	Prof.	Train.	Prof.	Train.	Prof.	Train.	Prof.
Intellectual abilities								
Intelligence	.24[c]	.18[c]	.18[c]	.16[c]	.18[b]	.18[c]	.49[a]	.22[c]
Immediate memory	.23[b]	.13[c]	.10[a]	.22[b]	.15	.08[c]	.33[a]	...
Substitution	.34	.24[c]	...	.10[b]	.34	.29[c]	...	...
Arithmetic	.32[c]	.13[c]	.14[c]	.12[b]	.41[b]	.13[c]	.46[c]	...
Spatial perception								
Spatial relations	.26[c]	.14[c]	.21[b]	.15[c]	.25[b]	.13[c]	.37[a]	...
Location	.28	.15[c]	...	.16[c]	.28	.15[c]	...	...
Perception of details								
Number comparison	...	.16[c]	...	.11[b]	.06	.17[c]	...	...
Name comparison	...	.16[c]	...	.14[b]	.03	.16[c]	...	...
Cancellation	...	.32[c]	...	.14	...	.32[c]	...	...
Pursuit	...	.15[c]	...	.11[b]	...	.15[c]	...	...
Perceptual speed	.20[b]	.54[b]	.08[b]	.30	.51[a]	.56[b]	...	...
Mechanical comprehension								
Mechanical principles	.36[c]	.27[c]	.36[c]	.23[c]	.38[a]	.46[a]	...	...
Motor abilities								
Tracing	...	.18[c]	...	.22[b]	...	.17[c]	...	...
Tapping	.09	.13[c]	...	.15[b]	.09	.13[c]	...	...
Dotting	...	.16[c]	...	.21[b]	...	.15[c]	...	...
Finger dexterity	.34[a]	.19[c]	.11	.14[c]	.40[a]	.20[c]	...	.34
Hand dexterity	...	.15[c]	...	.03	...	.15[c]	...	...
Arm dexterity	...	.17[c]	...	.00[c]	...	.23[c]	...	...
Personality traits								
Personality	...	.31[a]	...	...	...	.31[a]	...	...
Interest	...	.23[a]	...	.28	...	.14	...	...
Personal data	...	.49[c]	...	.48[c]	...	.58[a]	...	...

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

COMPARISON OF TRAINING AND PROFICIENCY CRITERIA

The validity of tests has been examined separately for training and proficiency criteria. A comparison of the relative predictiveness of these two types of criteria now seems in order. It will be worth while to consider also the extent to which training and proficiency criteria involve the same patterns of abilities and traits that are measured by the various tests and inventories.

The basic data in the analyses to follow are pairs of validity coefficients, one coefficient for training criteria and the other for proficiency criteria, for a given type of test applied to a given type of job. Only those pairs of coefficients in which both members were based upon one hundred or more cases were used. The broadest groupings of jobs were utilized, that is, the groupings given by the first digit of the code number for all three types of occupational groupings. The only exception was for the *Dictionary of Occupational Titles* classification, wherein clerical, sales, and service occupations were differentiated further on the basis of the second digit (see tables 9 and 10).

THE RELATIVE PREDICTIVENESS OF TRAINING AND PROFICIENCY CRITERIA

Table 18 compares validity for the two types of criteria by test. Thus it will be seen in the table that when the general classification of jobs was used, it was possible to obtain seventeen pairs of coefficients for tests of intellectual abilities. Training criteria uniformly yield higher validity coefficients than do proficiency criteria. The degree of superiority is about equal for tests of intellectual abilities, spatial abilities, perception of details, and mechanical comprehension. It is relatively slight for measures of motor ability and personality traits.

An analysis similar to the foregoing is made in table 19 by type of job. Again the superior predictability of training criteria is seen. The difference in validity is most marked for the protective and service occupations. For office and industrial occupations the differences are of about the same order.

In about three-quarters of the comparisons, the validity of tests for training criteria is higher than that for proficiency criteria. On the average the difference in validity is .09. The greater predictiveness of training criteria is understandable, since worker-training programs frequently are conducted under fairly well controlled conditions. Measurements of success in training, therefore, might be expected to be more reliable than measurements of success on the actual job itself, where many uncontrolled factors operate. More reliable criteria are, of course, more predictable.

TABLE 18

Comparison of Validity Coefficients of Tests for Training and Proficiency Criteria by Type of Test

Type of test	No. of pairs of coefficients	Average validity coefficient		Instances where validity is higher for training criteria (per cent)
		Train.	Prof.	
Intellectual abilities				
General occupational classification	17	.34	.18	88
Dictionary of Occupational Titles classification	15	.33	.22	80
Entry occupational classification	16	.36	.20	94
Spatial abilities				
General occupational classification	7	.27	.14	100
Dictionary of Occupational Titles classification	6	.28	.14	100
Entry occupational classification	6	.28	.15	100
Perception of details				
General occupational classification	12	.27	.22	75
Dictionary of Occupational Titles classification	10	.27	.20	70
Entry occupational classification	11	.28	.22	73
Mechanical comprehension				
General occupational classification	3	.38	.29	67
Dictionary of Occupational Titles classification	3	.37	.26	100
Entry occupational classification	3	.38	.25	100
Motor abilities				
General occupational classification	16	.20	.17	44
Dictionary of Occupational Titles classification	14	.22	.16	72
Entry occupational classification	11	.20	.17	64
Personality traits				
General occupational classification	2	.46	.43	50
Dictionary of Occupational Titles classification	2	.45	.40	50
Entry occupational classification	2	.45	.45	50

TABLE 19

Comparison of Validity Coefficients of Tests for Training and Proficiency by Type of Job

Type of job	No. of pairs of coefficients	Average validity coefficient		Instances where validity is higher for training criteria (per cent)
		Train.	Prof.	
General occupational classification				
Clerical occupations (20)	16	.31	.23	75
Protective occupations (40)	5	.36	.21	100
Service occupations (50)	2	.55	−.02	100
Vehicle operators (60)	3	.23	.13	100
Trades and crafts (70)	19	.23	.21	58
Industrial occupations (80)	12	.27	.17	67
All occupations	57	.28	.19	72
Dictionary of Occupational Titles classification				
Clerical occupations (1-0 to 1-4)	17	.29	.21	76
Personal service occupations (2-2 to 2-5)	1	.61	.07	100
Protective service occupations (2-6)	5	.36	.21	100
Skilled occupations (4, 5)	19	.26	.19	79
Semiskilled occupations (6, 7)	8	.28	.20	63
All occupations	50	.29	.20	78
Entry occupational classification				
Public service work (0-X)	4	.38	.21	100
Clerical and sales work (1-X)	16	.31	.22	75
Service work (2-X)	2	.55	.12	100
Mechanical work (4-X)	19	.26	.19	74
Manual work (6-X)	8	.28	.22	88
All work	49	.30	.20	80

It is possible also that the lower validity coefficients for proficiency result from a reduction in range of talent. Whatever the range of talent of persons who enter training for a particular job may be, the range of talent can be expected to be somewhat narrower among those who survive the training period and remain on the job long enough to be included in a validation study. Workers whose performance is inferior will leave both during training and later on the job itself. Furthermore, persons who demonstrate superior proficiency on the job frequently are promoted, and hence the range of talent is reduced even further.

THE RELATIONSHIP BETWEEN VALIDITY COEFFICIENTS FOR TRAINING AND PROFICIENCY CRITERIA

It has just been shown that validity for training criteria tends to be higher than validity for proficiency criteria. It might be that the only difference in validity of tests for the two criteria lies in some fairly constant value or in some ratio. Thus for a particular job the validity of one test for training criteria might be .49 and for proficiency criteria .40, and that of another test .19 for training criteria and .10 for proficiency criteria. Tests, then, would have the same order of validity for the two criteria, with validity merely being somewhat higher for the one type than for the other. If this were so, conclusions drawn from validation studies conducted with one type of criterion could readily be generalized to apply to the other type. The data in table 18, however, indicate that the difference in validity is greater for some types of tests than for others. Consequently it appears desirable to examine the relationship between the validities of tests for training and proficiency criteria.

TABLE 20

COEFFICIENTS OF CORRELATION BETWEEN VALIDITY COEFFICIENTS FOR TRAINING AND PROFICIENCY CRITERIA

Type of job	No. of pairs of coefficients	Coefficient of correlation
General occupational classification		
Clerks (20)	16	.59
Trades and crafts (70)	19	.48
Industrial workers (80)	12	.15
All occupations	57	.25
Dictionary of Occupational Titles		
Clerical occupations (1-0 to 1-4)	17	.58
Skilled occupations (4, 5)	19	.02
Semiskilled occupations (6, 7)	8	−.13
All occupations	50	.15
Entry occupations		
Clerical work (1-X)	16	.63
Mechanical work (4-X)	19	.21
Manual work (6-X)	8	−.36
All work	49	.18

To this end, coefficients of correlation between the pairs of validity coefficients were calculated. These are given in table 20. Wherever the data were deemed sufficient, coefficients were computed for individual jobs. Taking all occupations together, the correlation between the two types of validity coefficients is rather low, being of the order of .20. This means that, while there is a tendency for both members of a pair of coefficients to be of the same relative magnitude, the tendency is slight. For a particular job a given test might have low validity for training criteria and high validity for proficiency criteria. Further examination of table 20 indicates that the similarity between the two types of validity coefficients is fairly substantial for clerical jobs and very slight for industrial jobs.

These results indicate that for validation studies of tests conducted with clerical jobs it is possible to generalize with a fair degree of confidence the findings from one type of criterion to the other. With industrial occupations, however, independent studies must be conducted for each type of criteria. A further implication of these findings is that the relative importance of abilities and traits in learning clerical jobs is fairly similar to their relative importance in actually performing the job. In industrial occupations the relative importance of abilities for learning is very different from the relative importance in actual job performance.

GENERAL PREDICTIVE POWER OF TESTS

In the early days of worker selection, intelligence tests were used almost exclusively. The underlying notion was that intelligence is a general factor important in the performance of all types of jobs and that it can be measured by intelligence tests. As more and more information was collected in regard to the effectiveness of tests in the prediction of occupational success, a number of instances of low validity were encountered. Furthermore, studies of the intercorrelations among scores earned on different tests suggested that no general ability factor exists. These findings led to the conclusion that neither intelligence tests, nor indeed any other type of test, measure such general abilities that they can be used to predict success in all jobs.

This conclusion seems reasonable in the light of the available information, but its validity should still be tested. Certainly the evidence from the power of tests to predict occupational success is fragmentary. There has been no systematic investigation of the validity of tests over a wide variety of jobs. Therefore it seemed worth while to examine the notion that no test has general validity for all types of jobs on the basis of the material gathered in the present study.

To this end the grand average validity coefficient was computed for

TABLE 21

AVERAGE VALIDITY COEFFICIENTS OF EACH TYPE OF TEST FOR ALL JOBS

Type of test	Type of criterion	
	Train.	Prof.
Intellectual abilities		
Intelligence	.38[c]	.19[c]
Immediate memory	.29[c]	.19[c]
Substitution	.26[c]	.21[c]
Arithmetic	.41[c]	.21[c]
Spatial abilities		
Spatial relations	.31[c]	.14[c]
Location	.24[c]	.15[c]
Perception of details		
Number comparison	.26[c]	.21[c]
Name comparison	.25[c]	.21[c]
Cancellation	.29[c]	.20[c]
Pursuit	.19[c]	.17[c]
Perceptual speed	.39[c]	.27[c]
Mechanical comprehension		
Mechanical principles	.34[c]	.26[c]
Motor abilities		
Tracing	.16[c]	.16[c]
Tapping	.12[c]	.14[c]
Dotting	.14[c]	.15[c]
Finger dexterity	.22[c]	.19[c]
Hand dexterity	.38[a]	.14[c]
Arm dexterity	.30[b]	.17[c]
Personality traits		
Personality	.16	.21[c]
Interest	.14[a]	.27[c]
Personal data	.44[c]	.41[c]

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

each test from all the data available on all jobs. These values are given in table 21. While the grand average validity coefficients are presented for personality, interest, and personal data questionnaires, these instruments will not be considered in the discussion. In the first place, the concern here is with measures of ability, and second, the items included in these categories of measuring devices are very heterogeneous.

For almost all the tests, the grand average coefficients are higher for training criteria than for proficiency criteria. The coefficients cluster around a value of .27 for training criteria and .16 for proficiency criteria. None of the coefficients is zero and the lowest is .12. Therefore, taking all jobs as a whole, every test has some general predictive power, though for proficiency criteria it tends to be fairly low.

For training criteria, seven tests have average validity coefficients of .30 or greater: intelligence, arithmetic, spatial relations, perceptual speed, mechanical principles, and hand and arm dexterity. None of the tests has a validity as high as .30 for proficiency criteria; the highest coefficient is .27 for perceptual speed tests. Thus, while none of the tests has a validity high enough to be considered generally useful in predicting job proficiency, several tests do seem to be valuable in predicting general trainability. It will be noted that the tests useful in predicting general trainability are not restricted to any one particular type of test, but constitute a random sample of all types. Indeed, the four tests with the highest validity, of the order of .40, are very different. These tests are intelligence, arithmetic, perceptual speed, and hand dexterity.

This analysis indicates that we must modify the conclusion that no test has general validity that can be used to predict success in all jobs. In the prediction of proficiency criteria it is true that no test has very high general validity, yet all tests have validity greater than zero and a number of them have validity of the order of at least .20. In the prediction of training criteria, four tests have substantial general predictive power, and for a number of tests general validity is at least moderately high.

MAXIMUM VALIDITY OF INDIVIDUAL TESTS

As we have seen, the over-all validity of tests is by no means high. The highest over-all validity coefficient is .41. However, this should not be interpreted to mean that the validity of tests is uniformly low. Different jobs have different requirements in terms of abilities and traits. A test that has low validity for one job or one criterion might have rather high validity for another job or another criterion. Of some interest, therefore, will be the maximum validity of individual tests. Such maximum values will give additional information concerning the utility of tests. If, at the very best, a test has a validity of the order of .25, it will be of limited value in an experimental test battery. On the other hand, a test that has a validity of .50 when applied to the most appropriate job and criterion is worth considering.

For each test applied to each criterion the highest validity coefficient for any job was ascertained, using only the coefficients based on one hundred or more cases. Maximum values are given in table 22 for all three types of occupational classification systems. Many of these values are substantial in magnitude. Since any particular system of occupa-

TABLE 22

MAXIMUM VALIDITY COEFFICIENT FOR EACH TEST FOR ANY JOB

Type of test	General occupational classification		*Dictionary of Occupational Titles*		Entry occupations		Maximum validity coefficients
	Train.	Prof.	Train.	Prof.	Train.	Prof.	
Intellectual abilities							
Intelligence	.50	.47	.61	.56	.61	.55	.61
Immediate memory	.32	.36	.34	.43	.34	.39	.43
Substitution	.34	.26	.44	.35	.36	.40	.44
Arithmetic	.59	.41	.54	.53	.61	.37	.61
Spatial abilities							
Spatial relations	.42	.43	.45	.56	.42	.56	.56
Location	.29	.28	.34	.30	.29	.46	.46
Perception of details							
Number comparison	.35	.33	.35	.40	.40	.35	.40
Name comparison	.40	.34	.41	.45	.41	.38	.45
Cancellation	.48	.36	.59	.51	.24	.40	.59
Pursuit	.28	.35	.22	.38	.22	.35	.38
Perceptual speed	.43	.38	.46	.29	.51	.42	.51
Mechanical comprehension							
Mechanical principles	.41	.57	.49	.66	.41	.66	.66
Motor abilities							
Tracing	.24	.42	.31	.26	.29	.26	.42
Tapping	.23	.32	.24	.40	.25	.40	.40
Dotting	.22	.28	.23	.34	.23	.40	.40
Finger dexterity	.44	.30	.57	.42	.57	.42	.57
Hand dexterity	.50	.29	.50	.38	.50	.38	.50
Arm dexterity	.54	.24	.54	.55	.54	.30	.55
Personality traits							
Personality	...	.37	...	.37	...	.50	.50
Interest	...	.34	...	.38	...	.34	.38
Personal data	.60	.58	.60	.60	.61	.60	.61

tional classification might mask maximum validity by combining different jobs, the maximum validity for each test for any type of job and criterion is given in the last column of the table. Only one type, the pursuit test, has a maximum validity of less than .40, and for it the maximum validity is .38. For half of the tests maximum validity coefficients are .50 or above. Therefore it can be concluded that in one area or another every test has substantial value in worker selection and placement.

ESTIMATES OF VALIDITY IN THE ABSENCE OF SPECIFIC DATA

Even a cursory glance at the tables which present the validity coefficients (tables 2–17 and Appendices A and B) reveals that for many jobs there is very little information on the effectiveness of tests. For a number of jobs, data are available for only one or two types of tests. The development of testing programs for such jobs is seriously handicapped by the lack of background information. The question then arises whether it is possible to estimate validity where no direct facts are at hand. It might be that reasonable estimates could be made on the basis of other validity data available for the job under consideration. Thus, when the validity of two types of tests for a given job is known, it might be possible to estimate the validity of a third type of test.

To this end the tables of validity coefficients were examined. For only one of the three systems of occupational classification, the general occupational classification, are data for the various types of jobs sufficiently extensive to permit estimations of validity. Even with this classification, a reasonable coverage of jobs holds only for proficiency criteria. Consequently, estimations of validity were attempted only in this one instance. The basic data were the validity coefficients for proficiency criteria given in tables 2–7.

A study of validity coefficients for tests in the prediction of proficiency criteria for jobs grouped according to the general occupational classification revealed certain consistencies among the coefficients. Certain tests gave about the same pattern of coefficients. That is, they tended to have relatively high validity for, say, job A, somewhat lower validity for job B, and little or no validity for job C. Another group of tests tended to have a different pattern of coefficients: high validity for job C, intermediate validity for job B, and low validity for job A.

In order to note more exactly such consistencies, coefficients of correlation were computed among the validity coefficients. In computing these coefficients the validity coefficients were used as scores, the jobs were used as individuals or objects, and the tests were used as variables. The jobs used as individuals were those designated by two digits, the finest classification. Only those validity coefficients based upon one hundred or more cases were used as scores.

Since validity coefficients for all tests were not available for every job, the correlations among tests necessarily had to be based upon different numbers of cases. The manner in which coefficients of correlation between the validity coefficients of tests were computed can

TABLE 23

Intercorrelations Among Validity Coefficients for Proficiency of Jobs Classified According to General Occupational Classifications

	1	2	3	4	5	6	7	8	9	11	17ᵃ	10	14	15	16	18
1. Intelligence		.47	.74	.50	.50	.59	.00	.50	−.24	.21	.69	−.64	.24	−.31	.33	.40
2. Immediate memory	13		1.00	.26	.50	1.00	−.39	.31	−.50	−.49	−.49	.00	.31	−.31	.00	.49
3. Substitution	8	8		.71	.80	.97	−.97	.60	.57	.00	.76	−.80	.00	−.73	.00	−.98
4. Arithmetic	18	12	8		.29	.60	−.16	.81	.00	.54	.00	−.69	−.43	−.98	.49	−.63
5. Number compar.	12	12	7	12		.56	−.41	−.75	−.48	−.81	−.49	.43	.00	.25	.31	.49
6. Name comparison	11	10	7	11	11		−.92	.21	.00	.00	−.98	−.38	.73	−.73	.48	.00
7. Cancellation	9	7	6	9	8	7		.54	.49	.49	.75	.99	.00	.49	−.49	−.09
8. Tracing	10	10	7	10	8	7	5		.81	1.00	.94	.00	.35	−.50	−.31	.09
9. Location	13	11	8	11	9	8	6	10		.88	1.00	.36	.83	.00	.43	.49
11. Spatial relations	15	12	8	13	10	9	6	10	12		.99	.00	.81	−.31	−.19	.49
17. Hand dexterityᵃ	8	6	5	8	6	6	5	5	6	7		.00	.50	.50	.45	−.52
10. Pursuit	9	9	7	8	7	7	5	9	9	9	5		.00	.69	.45	.95
14. Tapping	11	10	8	11	9	8	6	9	11	10	6	8		.59	.31	1.00
15. Dotting	10	10	8	11	9	8	6	9	11	10	6	8	11		.82	1.00
16. Finger dexterity	15	12	8	12	10	9	6	10	12	14	7	9	10	10		.50
18. Hand dexterity	7	6	5	7	6	6	5	5	6	6	7	5	6	6	7	

Values to the left of the diagonal are the numbers of cases on which the coefficients are based.

ᵃ Signs reversed.

be clarified by two examples. Validity coefficients for intelligence tests were available for all twenty-one jobs, but for arithmetic tests there were validity coefficients for only eighteen jobs. There were no data on arithmetic tests for electrical workers, processing workers, and gross manual workers. Thus for eighteen jobs, validity coefficients were available for both intelligence and arithmetic tests, and this was the number of objects upon which the correlation between the validity coefficients for intelligence and arithmetic tests was based.

In the case of spatial relations and hand dexterity tests the situation was very different. For spatial relations tests there were validity coefficients for sixteen jobs: foremen, general clerks, recording clerks, computing clerks, protective workers, vehicle operators, mechanical repairmen, electrical workers, structural workers, processing workers, complex machine operators, machining workers, machine tenders, bench workers, inspectors, and packers. For hand dexterity tests there were validity coefficients for nine jobs: general clerks, service workers, mechanical repairmen, machining workers, machine tenders, bench workers, inspectors, packers, and gross manual workers. For only seven jobs, validity coefficients were available on both spatial relations and hand dexterity tests: general clerks, mechanical repairmen, machining workers, machine tenders, bench workers, inspectors, and packers. Therefore seven was the number of objects used in computing the coefficient of correlation between spatial relations and hand dexterity tests. For two tests, perceptual speed and mechanical principles, the number of objects was so few that they were not included in the correlational analysis.

The coefficients of correlation among validity coefficients of the various tests, together with the number of cases on which they were based, are given in table 23. The individual coefficients vary widely, ranging from high positive to high negative values. The signs of the coefficients for one test, hand dexterity, have been reversed. As will be seen later, this reversal was made because the validity coefficients of the test then fitted in with a more general pattern.

A study of the intercorrelations among the tests as given in table 23 suggests that the tests fall fairly readily into three groups. Within each group the tests tend to have high intercorrelations, and, on the average, correlations between tests of different groups are low. One group consists of intelligence, immediate memory, substitution, arithmetic, and number and name comparison tests. A second group consists of cancellation, tracing, location, spatial relations, and hand dexterity tests (with signs of the correlations reversed). A third group consists of pursuit, tapping, dotting, and finger and arm dexterity tests. These three groups of tests are designated intellectual ability, spatial ability, and motor ability, indicating the characteristics that apparently are most common to all the tests in each group.

Tryon's method of cluster analysis provides a ready and meaningful way of describing groupings of variables in terms of their intercorrelations.[6] In his procedure a group of variables (e.g., tests) closely correlated with each other, and having the same pattern of correlations with other variables, is termed a cluster. This cluster can be thought of as a sample of variables drawn from an infinite domain of similar variables. A domain is analogous to a factor in classical multiple factor analysis. Tryon has provided formulae for calculating the coefficient of correlation between a variable and a theoretical cluster domain, between the composite of the variables comprising a cluster sample and a cluster domain, and between cluster domains. The coefficient of correlation between one of the variables comprising a cluster sample and its theoretical domain is the domain validity of that variable. This coefficient is analogous to a factor loading in multiple factor analysis. The coefficient of correlation between the composite of the variables comprising a cluster and its domain is similar to the index of reliability, and describes the extent to which the cluster variables taken together sample the theoretical domain. The coefficients of correlation among domains, which are analogous to the coefficients of correlation among factors, indicate the degree to which the domains are independent dimensions. Low intercorrelations among domains mean that the dimensions measure different characteristics.

When the variables comprising a cluster are homogeneous the clustering is effective. High domain validities are the first test of homogeneity. Another test of the homogeneity of a cluster is the consistency of the coefficients of correlation between the variables defining one domain with other domains. If these variables show lower and very similar coefficients with every other domain, then again they may be said to be homogeneous. With a homogeneous cluster the coefficient of correlation between the composite of the variables defining a cluster and the theoretical domain will be high.

In table 24 are given the coefficients of correlation between each of the tests and the three groups or domains of intellectual ability, spatial ability, and motor ability. The domain validity coefficients for the variables defining each cluster are high; hence, in terms of the domain validity of individual variables, the clustering is satisfactory. Three tests have domain validities exceeding unity. These impossible values undoubtedly arise out of the crudeness of the basic data. It will be remembered that the coefficients were not all based upon exactly the same cases and that the number of cases was sometimes rather small.

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[6] R. C. Tryon, Identification of social areas by cluster analysis, *Univ. Calif. Publ. Psychol.*, 1955, 8, 1–100.

If the clusters were completely homogeneous, the coefficients of correlation between the variables defining one domain and another domain, in addition to being lower than their domain validities, would be uniform in magnitude. The latter condition is not satisfied too well. For example, the coefficients of correlation between the variables defining the intellectual ability domain and the spatial ability domain range from .26 to –.66. The variables comprising one domain, therefore, vary considerably in terms of their correlations with any other domain.

TABLE 24

COEFFICIENTS OF CORRELATION BETWEEN VALIDITY COEFFICIENTS OF INDIVIDUAL TESTS AND DOMAINS OF TESTS

Test	Intellectual ability	Spatial ability	Motor ability
Intellectual ability domain			
1. Intelligence	*.70*[a]	.26	.01
2. Immediate memory	*.81*	–.35	.12
3. Substitution	*1.06*	.22	–.66
4. Arithmetic	*.59*	.27	–.56
5. Number comparison	*.67*	–.66	.38
6. Name comparison	*.94*	–.38	.03
Spatial ability domain			
7. Cancellation	–.60	*.64*	.23
8. Tracing	.35	*.93*	–.09
9. Location	–.14	*.90*	.53
11. Spatial relations	–.12	*.95*	.20
17. Hand dexterity	–.11	*1.04*	.23
Motor ability domain			
10. Pursuit	–.44	.30	*.66*
14. Tapping	.18	.56	*.60*
15. Dotting	–.59	.04	*.98*
16. Finger dexterity	.34	–.03	*.70*
18. Hand dexterity	–.05	.10	*1.09*

[a] Italicized values are domain validities of the tests defining the given domain.

The domain validities of the composites of variables are good. The composite of the six variables comprising the intellectual cluster is estimated to correlate .84 with its domain; the composite of the five variables comprising the spatial cluster is estimated to correlate .93

with its domain; and the composite of the five variables comprising the motor cluster is estimated to correlate .86 with its domain. In these terms the clustering is satisfactory.

The correlations among the three cluster domains are rather low. The coefficient between the intellectual and spatial cluster domains is −.14; the coefficient between the intellectual and motor cluster domains is .14; and the coefficient between the spatial and motor cluster domains is .25. The three dimensions of test validity, therefore, are quite independent.

From the domain validities of the tests as given in table 24, using all tests, weights were developed which could be used in computing a composite validity score for each job in each of the three domains. For a given domain the magnitude of the weights was proportional to the magnitude of the domain validities, and the weights carried the same signs as the domain validities. For example, in the domain of intellectual ability the greatest positive weight was carried by immediate memory, substitution, and arithmetic tests, and the greatest negative weight by cancellation, pursuit, and dotting tests. Since, for a large proportion of the jobs, validity coefficients were not available for all tests, domain scores were calculated on the basis of the data at hand.

In computing the composite validity scores the validity coefficients for each test were transmuted to T-scores, using jobs as individuals or objects. The means of these scores were set at 50 and the standard deviations at 10. The weight for each domain was applied in turn to the available validity T-score of each job. For each job three weighted average validity T-scores were thereby obtained. These weighted average scores for each of the three domains were again standardized with means of 50 and standard deviations of 10. Conclusions in regard to composite scores based upon small amounts of data obviously are in the nature of hypotheses rather than facts, and the scores themselves indicate relative and not absolute validity. The final composite T-score indices of validity are given in table 25.

The data for supervisory personnel are so few that any conclusions must be regarded merely as guesses. Intellectual ability has middling validity for both general supervisors and foremen. Surprisingly, spatial ability has higher validity for supervisors than for foremen. Motor ability has slightly less than average validity for both jobs.

Intellectual ability is very important in all clerical jobs. Spatial ability is of little importance except for computing clerks. Motor ability has about average validity for this occupation.

The data indicate that the jobs of sales clerks and salesmen have very different ability requirements. Intellectual ability is unimportant for the former and important for the latter, with the reverse being true for motor ability. Spatial ability has average validity for sales clerks and high validity for salesmen.

TABLE 25

STANDARD SCORE VALIDITY INDICES FOR VARIOUS JOBS IN EACH TEST DOMAIN

Job	Test domain		
	Intellectual ability	Spatial ability	Motor ability
11. General supervisors	53	60	48
12. Foremen	52	49	46
21. General clerks	60[c]	34[c]	48[c]
22. Recording clerks	59[c]	32[c]	53[c]
23. Computing clerks	58[c]	56[c]	43[c]
31. Sales clerks	32[b]	50	57
32. Salesmen	67	64	24
40. Protective workers	55[b]	40[a]	54
50. Service workers	33[a]	59[a]	41[a]
60. Vehicle operators	35[a]	50	69[a]
71. Mechanical repairmen	50	53[a]	48
72. Electrical workers	69	65[a]	56
73. Structural workers	41[b]	60[b]	63[b]
74. Processing workers	50[a]	53[b]	65[a]
75. Complex machine operators	58[c]	55[b]	46[c]
76. Machining workers	44[b]	30[c]	39[c]
81. Machine tenders	47[c]	39[c]	52[c]
82. Bench workers	39[c]	49[c]	59[c]
83. Inspectors	49[c]	52[c]	39[c]
84. Packers and wrappers	44[c]	43[c]	54[c]
85. Gross manual workers	53	52	50

Percentage of weights available for computation of standard score indices is indicated by letter symbols. 1-25 per cent, no letter symbol.
[a] 16–50 per cent. [b] 51–75 per cent. [c] 76–100 per cent.

For protective workers both intellectual and motor ability are important and spatial ability is unimportant. Spatial ability is the only one of importance for service workers. Motor ability is extremely important for vehicle operators, with the validity of spatial ability being average, and the validity of intellectual ability being low.

For workers in trades and crafts and in industrial occupations there is little consistency in validity. For each ability domain, one job in a given group will stand high and another low.

RELATIONSHIPS AMONG OCCUPATIONS IN TERMS OF ABILITIES

The three occupational classifications used in the present study are typical systems in that they group jobs into families on the basis of presumed similarity in the nature of the work, duties, and requirements. Thus, in the general occupational classification system the jobs of sales clerks and salesmen are grouped together because both are concerned with the interchange of goods and services. However, the bases of such occupational groupings are by no means as exact as they may appear at first glance. For example, in the *Dictionary of Occupational Titles* system, business machine operators are placed in the same category as coding clerks. This grouping can be justified on what is termed logical grounds because both classes of workers perform clerical tasks. Yet a case could be made that the job of business machine operator should be placed in the same family with that of loom operator since both jobs involve the operation of machines. It is apparent, therefore, that on logical grounds the same jobs could be classified in a variety of ways. The particular classification finally decided upon obviously depends on the personal inclinations and judgment of whoever is doing the classification. Consequently it would appear that occupational groupings accomplished on the basis of objective measures would be much more desirable.

Similarities among jobs can be described objectively in a variety of ways. Groupings can be based on whether the jobs involve the use of tools, whether the workers deal with the public, and so on. One of the most useful ways of describing similarity is in terms of ability requirements. If two jobs require the same abilities, then selective devices useful for one will be useful for the other, and workers who perform the one job well are very likely to perform the other well.

A good determination of similarities among jobs in terms of abilities calls for indices of the importance of a wide sampling of abilities on each of a wide variety of jobs. Such evidence is not at hand, but from the validity scores developed in the previous section some crude approximations can be made. The evidence suggested that there are three major areas of abilities: intellectual, spatial, and motor. The importance of each area was estimated for proficiency criteria for jobs classified according to the general occupational classification system, and these estimates were given as composite validity scores. The similarity between jobs in terms of measured abilities, then, can be gauged in terms of their similarities in composite validity scores.

The three ability areas form a three-dimensional space. On the basis of the composite validity scores given in table 25, each job can be plotted or positioned in this space. Jobs that have positions very close to each other in this space have very similar composite validity scores, and hence have similar ability requirements. Jobs that are far apart in this space have very different composite validity scores, and hence the relative importance of abilities for the one job is quite different from the relative importance of abilities for the other.

If the ability dimensions were completely uncorrelated, their axes would be orthogonal, that is, at right angles. The positioning of jobs in the ability space would then be very simple. Conceive of a square table top one edge of which is the spatial dimension and another at right angles to it, the motor dimension. The table top, then, is the plane formed by these two dimensions, and one corner of the table is the point of origin representing the zero point on the two dimensions. Now erect a vertical line from the point of origin at right angles to this plane. This line represents the intellectual dimension. Upright planes can be erected running through the spatial and intellectual dimensions, and the motor and intellectual dimensions. Each side plane also would be square, and the entire space a cube.

The position of a job can easily be located in this three-dimensional space. From the value on the spatial dimension representing the spatial score of the job a line is drawn along the table top perpendicular to the spatial dimension, and hence parallel to the motor dimension. From the value on the motor dimension representing the motor score of the job a line is drawn along the table top perpendicular to the motor dimension, and hence parallel to the spatial dimension. From the point at which two lines intersect on the table top a perpendicular is erected. This perpendicular is at right angles to the table top, and hence is parallel to the intellectual dimension. The length of this line is set as being equal to the intellectual score of the job. The point at the top of this perpendicular represents the position of the job in orthogonal space.

However, the three dimensions of validity scores are not independent. The three dimensions, therefore, describe not an orthogonal space but one with oblique dimensions. The coefficient of correlation between any two dimensions can be taken as the cosine of the angle between them. From these angles the oblique space can be erected. The sides of the space instead of being squares will be parallelograms, and the upright line representing the intellectual dimension will not rise vertically but will slant.

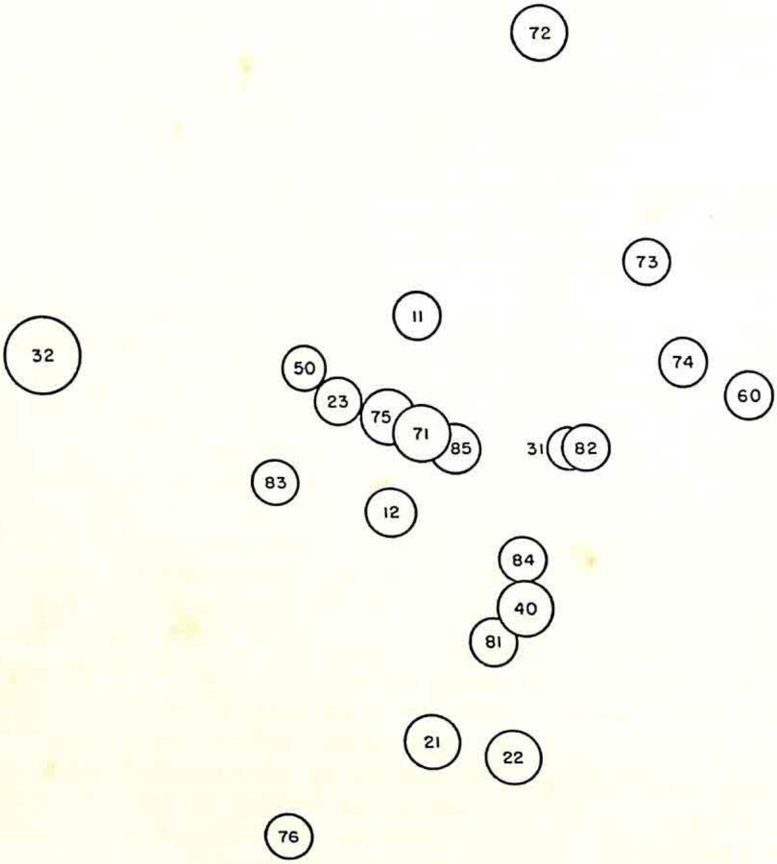

Fig. 2. Positions of jobs in the three-dimensional ability space.

The following procedure is used to plot or position a job in this oblique space. From the value on the spatial dimension representing the spatial score of a job a line is drawn across the table top parallel to the motor dimension. It therefore will not be at right angles to the spatial dimension. From the value on the motor dimension representing the motor score of the job a line is drawn along the table top not at right angles to the motor dimension but parallel to the spatial dimension. From the point on the table top at which the two lines intersect a line is drawn upward. This line is not at right angles to the table top but is parallel to the intellectual dimension, and hence rises at a slant. The length of this line represents the score of the job on the intellectual dimension. The point at the top of the line represents the position of the job in oblique space.

It is possible, of course, to rectify the space, setting new dimensions at right angles but maintaining the absolute positions of the jobs. The three new orthogonal dimensions could be set at any convenient positions. Projections from each job to the new dimensions could be made, and from the rectified scores the linear distances between the two jobs could readily be accomplished. In actual fact these determinations were carried out through appropriate trigonometric functions, and the positions of the jobs were ascertained and plotted in three-dimensional space.

Supposing now a view of the jobs in space is taken. The most informative view is one looking directly down upon the table top. This view is shown in figure 2. The motor dimension is horizontal, with low values to the left and high values to the right. Running up the page at an angle is the spatial dimension, with low values to the bottom and high values to the top. Upright from the page is the intellectual dimension, which is not perpendicular but at an angle. The size of the circles representing jobs indicates values on this dimension. Small circles are far away from the reader and represent low values; large circles are close to the reader and represent high values.

The actual linear distances between jobs in this space are given in table 26. It should be recognized that the units in which these distances are measured are T-scores on the oblique dimensions, and hence are arbitrary. By way of providing a frame of reference, it can be noted that the longest distance between any two jobs is 70, and the shortest distance between any two jobs is 5.

It is difficult to ascertain groupings among jobs from the distances given in table 26; hence reference will be made first to figure 2. Three major clusters of jobs appear: one at about the center, one to the left of this first cluster, and one below it. Three jobs, electrical workers (72), salesmen (32), and machining workers (76), appear to be complete isolates. The three tentative clusters can be examined more exactly in terms of their actual distances as given in table 26. On the basis of this examination one or two jobs will be rejected from each tentative cluster because of too great distance from the other members. Thereby, more or less arbitrarily, three final clusters of jobs were taken; the distances between the members of each cluster were relatively small. The jobs defining each cluster are given in table 27.

For each cluster of jobs the focal point in the three-dimensional aptitude space was determined, and the distance of each job from these focal points was calculated. The distances are given in table 27. It is apparent

TABLE 26

Distances Between Jobs in Oblique Dimensional Ability Space

Job	Job 11	12	21	22	23	31	32	40	50	60	71	72	73	74	75	76	81	82	83	84	85
11. General supervisors		12	28	31	9	22	47	20	22	25	17	19	18	16	8	34	21	18	14	17	8
12. Foremen			17	19	9	22	46	11	23	28	17	32	25	20	8	22	10	17	8	10	6
21. General clerks				5	22	35	45	11	39	38	20	44	38	30	21	19	15	30	23	20	21
22. Recording clerks					25	35	48	10	41	37	21	44	38	29	23	22	15	29	26	20	21
23. Computing clerks						28	40	17	26	32	12	26	26	22	3	29	19	23	11	18	9
31. Sales clerks							67	26	17	12	36	35	14	20	26	33	21	7	22	15	21
32. Salesmen								49	63	70	32	50	63	57	41	57	54	61	47	56	47
40. Protective workers									33	28	17	35	28	19	14	23	8	21	19	11	11
50. Service workers										28	38	37	24	30	27	33	27	20	18	23	24
60. Vehicle operators											37	33	11	25	30	41	25	11	31	19	24
71. Mechanical repairmen												27	32	24	11	35	23	30	22	24	15
72. Electrical workers													23	22	25	53	38	31	33	33	26
73. Structural workers														12	24	42	26	12	27	20	20
74. Processing workers															19	37	21	13	26	16	15
75. Complex machine operators																29	17	21	12	16	6
76. Machining workers																	18	31	22	23	27
81. Machine tenders																		16	16	6	13
82. Bench workers																			21	10	15
83. Inspectors																				17	12
84. Packers																					11
85. Gross manual																					

TABLE 27

Distances Between Various Jobs and Focal Points of Three Clusters in Aptitude Space

	Distance from focal point of cluster		
	Cluster A	Cluster B	Cluster C
Cluster A			
21. General clerks	9	21	35
22. Recording clerks	9	23	34
40. Protective workers	4	15	24
81. Machining workers	6	15	21
84. Packers	11	13	15
Cluster B			
11. General supervisors	22	8	20
12. Foremen	11	5	22
23. Computing clerks	16	5	26
75. Complex machine operators	16	4	24
83. Inspectors	18	8	25
85. Gross manual workers	13	5	19
Cluster C			
31. Sales clerks	26	23	7
60. Vehicle operators	31	28	7
73. Structural workers	30	23	7
82. Bench workers	21	18	5
Unclustered jobs			
32. Salesmen	50	44	65
50. Service workers	32	23	21
71. Mechanical repairmen	20	15	33
72. Electrical workers	38	27	29
74. Processing workers	22	20	13
76. Machining workers	48	60	51

from the table that the jobs taken as defining each cluster are close to the focal point of that cluster, and the other jobs are more distant.

The first cluster of jobs, Cluster A, includes general and recording clerks, protective and machining workers, and packers. The focal point of this cluster is defined by the following values: intellectual ability 53, spatial ability 38, and motor ability 52. These five jobs therefore are characterized as requiring intellectual and motor abilities, with little demand upon spatial abilities.

The second, Cluster B, consists of general supervisors, foremen, computing clerks, complex machine operators, inspectors, and gross manual workers. The values of 54 in intellectual ability, of 54 in spatial ability, and 45 in motor ability define the focal point of this cluster. Intellectual and spatial abilities are of considerable importance for these jobs, and motor abilities are of some though lesser importance.

The third cluster, Cluster C, includes sales clerks, vehicle operators, structural workers, and bench workers. The values that define the focal point of this cluster are intellectual ability 37, spatial ability 52, and motor ability 62. Motor abilities are of great importance for these jobs and spatial abilities have considerable importance. Intellectual abilities, however, contribute very little toward differentiating superior from inferior workers on these jobs.

Salesmen, service workers, mechanical repairmen, electrical workers, processing workers, and machining workers, do not readily fit any of these three clusters, and, in addition, these six jobs seem quite unlike. Thus about 30 per cent of the jobs do not fit together in any particular pattern.

None of the jobs defining any of the three clusters appear to have much in common except for similarity in aptitudes. In Cluster C, for example, including the very different jobs of sales clerks, vehicle operators, structural workers, and bench workers, the last three might be said to involve manual or mechanical activity, but the first does not. Furthermore, other manual and mechanical jobs fall in other clusters. It seems that sensible common characteristics cannot be determined readily for any of the three clusters. Thorndike and Norris, using a different method, also found that jobs grouped on the basis of similarity in measured aptitudes have little superficial similarity.[7]

SUMMARY

The present study was undertaken in order to gain a broad understanding of the effectiveness of aptitude tests in the selection and placement of workers. To this end the results of both published and unpublished investigations of the validity of aptitude tests were summarized. In effecting this summary, tests were classified in twenty-one types, criteria in the two kinds of training and job proficiency criteria, and jobs according to three different systems. Where data were available, an average validity coefficient was computed for each type of test, criterion, and job. Since in many instances there was little or no information, estimates of validity were made by means of a correlational analysis of the available validity coefficients.

The average validity coefficients are presented in detail for the various jobs in a number of tables and in two appendices. For purposes of ascertaining more general trends, average validity coefficients are presented for occupations or job families also. Frequently the concrete evidence concerning validity does not correspond with popular beliefs.

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[7] R. L. Thorndike and R. C. Norris, Empirical evidence on Air Force career fields, Air Training Command, Human Resources Research Center, *Research Bull.*, 52-13, 1952.

Training criteria were found to be more predictable than criteria reflecting actual proficiency in job performance. Except for clerical occupations, there is little correspondence in the validity of tests for the two types of criteria. These findings suggest that performance in training and on the job involve very different patterns of abilities.

All tests seem to have some measure of general validity, being useful for predictive purposes over a wide range of jobs. A number of tests have substantially high validity for training criteria, but for job proficiency criteria the level of general validity is low. However, in one area or another every type of test has substantial value in the prediction of occupational success.

When jobs are examined in terms of their similarity in aptitude requirements, no rational pattern emerges. While some jobs are very similar to others in such requirements, groupings are far from being clear-cut.

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APPENDIX A

AVERAGE VALIDITY COEFFICIENTS OF TESTS FOR JOBS CLASSIFIED ACCORDING TO DICTIONARY OF OCCUPATIONAL TITLES

MANAGERIAL AND OFFICIAL OCCUPATIONS (0-72 to 0-99)

0-72. RETAIL MANAGERS

Train.	*Prof.*	
	.50[a]	Intelligence
	.33	Personality

0-97 to 0-99. MANAGERS AND OFFICIALS

Train.	*Prof.*	
	.34[c]	Intelligence
	.20[a]	Arithmetic
	.32[a]	Cancellation
.16	.16[b]	Personality
	.53	Interest
	.36[a]	Personal data

CLERICAL AND KINDRED OCCUPATIONS (1-01 to 1-49)

1-01. BOOKKEEPERS AND CASHIERS

Train.	*Prof.*	
.37	.24[b]	Intelligence
	.25[a]	Immediate memory
	.17[a]	Substitution
	.64	Arithmetic
	.24[a]	Number comparison
	.37[a]	Name comparison
	.23[a]	Cancellation
	.24[a]	Tapping
	.23[a]	Dotting
	.35[a]	Personal data

1-02. BOOKKEEPING MACHINE OPERATORS

Train.	*Prof.*	
.28[a]	.17[a]	Intelligence
.46	.06[a]	Immediate memory
.44	.03[a]	Substitution
.35	.17[a]	Arithmetic
.36	.32[a]	Number comparison
.19	.35[a]	Name comparison
	−.03[a]	Cancellation
.01	−.16	Tapping
.16	−.06[a]	Dotting
	−.11[a]	Finger dexterity
	−.05	Hand dexterity
	.34	Arm dexterity

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

1-03. CHECKERS

Train.	*Prof.*	
	.56	Intelligence
	.23	Cancellation
	.21[a]	Personality

1-05. GENERAL OFFICE CLERKS

Train.	*Prof.*	
.42[c]	.43[c]	Intelligence
	.34[a]	Immediate memory
.21[a]	.35[b]	Substitution
.43[c]	.37[c]	Arithmetic
.27[c]	.07	Spatial relations
	−.01	Location
.42	.24[b]	Number comparison
.41[a]	.26[c]	Name comparison
	.20[a]	Cancellation
	−.28	Pursuit
.25[c]		Mechanical principles
	−.10	Tracing
	−.28	Tapping
	−.07	Dotting
	.28[a]	Finger dexterity
	.13[a]	Hand dexterity
	.14[a]	Arm dexterity
	.35[a]	Personality
	.35[a]	Personal data

1-06. FINANCIAL INSTITUTION CLERKS

Train.	*Prof.*	
.07		Intelligence

1-08. INSURANCE CLERKS

Train.	*Prof.*	
	.17[a]	Intelligence
	.10[a]	Immediate memory
	.23[a]	Arithmetic

1-17. FILE CLERKS

Train.	*Prof.*	
	.32[a]	Intelligence
	−.22	Immediate memory
	−.42	Substitution
	.21[a]	Arithmetic
	.07	Spatial relations
	−.11[a]	Location
	−.39	Number comparison
	−.47	Name comparison
	.02	Cancellation

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	−.25	Pursuit
	−.09	Tracing
	−.28	Tapping
	−.05	Dotting

1-18. GENERAL INDUSTRY CLERKS

Train.	*Prof.*	
	−.44	Intelligence
	.25	Immediate memory
	.22	Substitution
	.45	Arithmetic
	.01	Spatial relations
	.10	Location
	.20	Number comparison
	.16	Name comparison
	.25	Pursuit
	.06	Perceptual speed
	.21	Tapping
	.15	Dotting
	.34[a]	Finger dexterity
	.41	Hand dexterity
	.23	Personal data

1-25. OFFICE MACHINE OPERATORS

Train.	*Prof.*	
.33[a]	.19[c]	Intelligence
	.34[a]	Immediate memory
.22	.30[b]	Substitution
.45[a]	.25[b]	Arithmetic
	.07[a]	Spatial relations
.49	.17[b]	Location
.35[a]	.30[c]	Number comparison
	.33[b]	Name comparison
.11	.20[c]	Cancellation
	.19[a]	Pursuit
.31[b]		Perceptual speed
.08	.21[a]	Tracing
.24[a]	.16[a]	Tapping
	.15[b]	Dotting
	.18[a]	Finger dexterity
	.21	Hand dexterity
	.20	Arm dexterity
	.19[a]	Personality
	.27[a]	Personal data

1-26. PAYMASTERS, PAYROLL CLERKS, AND TIMEKEEPERS

Train.	*Prof.*	
	.14	Substitution
	.36	Arithmetic

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.21	Number comparison
	.22	Name comparison

1-33. SECRETARIES

Train.	*Prof.*	
	.33	Intelligence
	.08	Cancellation
	.22[a]	Personality

1-36. STATISTICAL CLERKS AND COMPILERS

Train.	*Prof.*	
	.22[b]	Intelligence
	.43[a]	Immediate memory
	.30	Substitution
	.53[a]	Arithmetic
	.40[a]	Number comparison
	.45[a]	Name comparison
	.40[a]	Cancellation

1-37. STENOGRAPHERS AND TYPISTS

Train.	*Prof.*	
.40[c]	.28[c]	Intelligence
.32[c]	.40[a]	Immediate memory
.25[b]	.06	Substitution
.47[c]	.28[a]	Arithmetic
.28[c]		Spatial relations
.25[b]		Location
.31[a]	.29[a]	Number comparison
.36[a]	.36[a]	Name comparison
.59[a]	.28[a]	Cancellation
.22[a]		Pursuit
.43[c]		Perceptual speed
.24[c]		Mechanical principles
.16[a]		Tracing
.24[a]	.15	Tapping
.11[a]	.07[a]	Dotting
.07[b]	.26[a]	Finger dexterity
.30	.16	Hand dexterity
.09	−.09	Arm dexterity
	.13[a]	Personality
	−.02	Interest
.60[c]		Personal data

1-38. STOCK CLERKS

Train.	*Prof.*	
.35[a]		Personal data

1-41. TELEGRAPH OPERATORS

Train.	*Prof.*	
.12		Intelligence

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.32		Substitution
.29		Arithmetic
.22		Spatial relations
.20		Location
.13		Number comparison
.20		Tracing
.16		Tapping
.20		Dotting
.21[a]		Finger dexterity

1-49. Clerks and Kindred Occupations

Train.	*Prof.*	
	.33[a]	Intelligence
	.10	Cancellation
	.10	Personality

SALES AND KINDRED OCCUPATIONS (1-51 to 1-97)

1-55. Canvassers and Solicitors

Train.	*Prof.*	
	−.08	Intelligence
	.29	Personality
	.63	Interest
	.60[a]	Personal data

1-57. Insurance Salesmen

Train.	*Prof.*	
	.27[b]	Intelligence
	.23	Arithmetic
	.22	Number comparison
	.34[b]	Personality
	.32[b]	Interest
	.48[c]	Personal data

1-70. Sales Clerks

Train.	*Prof.*	
	.33[a]	Personality
	.38[a]	Interest

1-75. Salespersons

Train.	*Prof.*	
	−.10[c]	Intelligence
	−.08[a]	Immediate memory
	−.16	Substitution
	−.12[a]	Arithmetic
	−.14[a]	Number comparison
	−.15[a]	Name comparison
	.02[b]	Cancellation
	.37[b]	Personality

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

	.34[b]	Interest
	.29[b]	Personal data

1-80. Salesmen to Consumers

Train.	*Prof.*	
	.52	Personality

1-85 to 1-87. Salesmen and Sales Agents, Except to Consumers

Train.	*Prof.*	
	.37[a]	Intelligence
	.72	Arithmetic
	.64	Personality
	.28[b]	Interest
	.60[a]	Personal data

DOMESTIC SERVICE OCCUPATIONS (2-01 to 2-09)

2-06. General Maids

Train.	*Prof.*	
−.02		Intelligence

PERSONAL SERVICE OCCUPATIONS (2-21 to 2-48)

Train.	*Prof.*	
−.31		Intelligence

2-27. Waiters and Waitresses

Train.	*Prof.*	
	−.15[a]	Intelligence
	−.11[a]	Arithmetic
	.14[a]	Number comparison
	−.17[a]	Name comparison
	−.27[a]	Cancellation
	−.09[a]	Hand dexterity
	−.01[a]	Arm dexterity

2-42. Attendants, Hospital and Other Institutions

Train.	*Prof.*	
.61[b]	.34	Intelligence
.54[b]		Arithmetic
.42[b]		Spatial relations
	.16[a]	Personality

PROTECTIVE SERVICE OCCUPATIONS (2-61 to 2-68)

2-61. Guards and Watchmen

Train.	*Prof.*	
	.36[a]	Intelligence
	.39	Arithmetic
	.43	Spatial relations
	.40[a]	Mechanical principles

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

2-63. Firemen

Train.	*Prof.*	
.43[a]	.07[a]	Intelligence
.28[a]	.23[a]	Immediate memory
.33[b]	.11[a]	Arithmetic
.33[a]		Spatial relations
.30[a]		Perceptual speed
.45[a]	.34	Mechanical principles
.35		Personal data

2-66. Policemen and Detectives

Train.	*Prof.*	
.54	.30[b]	Intelligence
	.39	Immediate memory
−.25	−.02	Arithmetic
.32[a]	.04[a]	Spatial relations
	.25[a]	Number comparison
	.36[a]	Name comparison
.28	.10[a]	Mechanical principles
	.19[a]	Finger dexterity
	.24[b]	Personality
−.09	−.01[a]	Interest

BUILDING SERVICE WORKERS AND PORTERS (2-82 to 2-95)

2-84. Janitors and Sextons

Train.	*Prof.*	
	.65	Intelligence
	.35	Spatial relations
	.07[a]	Finger dexterity

AGRICULTURAL, FISHING, FORESTRY, AND KINDRED OCCUPATIONS (3)

Train.	*Prof.*	
−.15		Intelligence

3-18. Poultry Farm Hands

Train.	*Prof.*	
.34		Intelligence

3-30. Fruit and Vegetable Graders and Packers

Train.	*Prof.*	
	.00	Intelligence
	−.04	Substitution
	−.02	Spatial relations
	.11	Location
	.08	Number comparison
	.09	Pursuit

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

	.35	Tapping
	.15	Finger dexterity
	.55[a]	Arm dexterity

PRODUCTION OF FOOD PRODUCTS (4, 6, 8-01 to 4, 6, 8-10)

8-05. CONFECTIONS, UNSKILLED WORKERS

Train.	*Prof.*	
	.16	Intelligence
	.29[a]	Immediate memory
	.20[a]	Substitution
	.22[a]	Arithmetic
	.12[a]	Spatial relations
	.12	Location
	.23[a]	Number comparison
	.22[a]	Name comparison
	.09	Tracing
	.07	Tapping
	.24	Dotting
	.06[b]	Finger dexterity
	.13[a]	Hand dexterity
	.21[a]	Arm dexterity

8-09. SLAUGHTERING AND PREPARATION OF MEAT PRODUCTS, UNSKILLED WORKERS

Train.	*Prof.*	
	−.30	Intelligence
	−.37	Hand dexterity
	−.28	Arm dexterity

MANUFACTURE OF TEXTILES (4, 6, 8-14 to 4, 6, 8-19)

4-14. KNIT GOODS, SKILLED WORKERS

Train.	*Prof.*	
	.06	Intelligence
	.26[a]	Immediate memory
	.34	Substitution
	.25[a]	Arithmetic
	.36[a]	Spatial relations
	.27[a]	Location
	.14[a]	Number comparison
	.22[a]	Name comparison
	.38[a]	Pursuit
	.14	Tracing
	.12	Tapping
	.05	Dotting
	.07[a]	Finger dexterity

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

6-14. KNIT GOODS, SEMISKILLED WORKERS

Train.	*Prof.*	
	.03[a]	Intelligence
	.14[b]	Immediate memory
	.20[a]	Substitution
	.13[a]	Arithmetic
	.08[b]	Spatial relations
	.14[b]	Location
	.13[a]	Number comparison
	.10[a]	Name comparison
	.16[a]	Pursuit
	.24[a]	Tracing
	.11[a]	Tapping
	.12[a]	Dotting
	.15[c]	Finger dexterity

8-14. KNIT GOODS, UNSKILLED WORKERS

Train.	*Prof.*	
	.17	Intelligence
	.14	Substitution
	.25	Arithmetic
	.24	Spatial relations
	.13	Location
	.38	Number comparison
	.45	Name comparison
	.25	Pursuit
	.20	Tracing
	.44	Tapping
	.40	Dotting
	.24	Finger dexterity
	.26	Interest

4-15. WEAVERS, SKILLED

Train.	*Prof.*	
	.12	Intelligence
	.27	Immediate memory
	.22	Substitution
	.10	Arithmetic
	.23	Spatial relations
	.30[a]	Location
	.23	Cancellation
	.24	Pursuit
	−.15	Mechanical principles
	.06	Tracing
	.20	Tapping
	.13	Dotting
	.16[a]	Finger dexterity

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

4-16. LOOM FIXERS, SKILLED

Train.	*Prof.*	
	.32	Intelligence
	−.07[b]	Spatial relations
	−.10[a]	Location
	.00	Pursuit
	.33	Mechanical principles
	−.07	Tracing
	−.03	Tapping
	.03	Dotting
	.02[b]	Finger dexterity
	−.06[a]	Arm dexterity
	−.13	Interest

6-18. NONPROCESS MANUFACTURE OF TEXTILES, SEMISKILLED WORKERS

Train.	*Prof.*	
	−.02	Spatial relations
	−.10	Location
	−.04	Tracing
	.06[a]	Finger dexterity

4-19. MANUFACTURE OF TEXTILES, SKILLED WORKERS

Train.	*Prof.*	
	−.17	Location
	.32	Pursuit
	.58	Tracing
	.02	Tapping
	−.26	Dotting
	.26	Finger dexterity
	.46	Hand dexterity
	.33	Arm dexterity

6-19. MANUFACTURE OF TEXTILES, SEMISKILLED WORKERS

Train.	*Prof.*	
	.10[a]	Intelligence
	.18[a]	Immediate memory
	.15[a]	Substitution
	.14[a]	Arithmetic
	.09[b]	Spatial relations
	.12[b]	Location
	.12[a]	Number comparison
	.13[a]	Name comparison
	.14	Cancellation
	.08[a]	Pursuit
	.16[a]	Tracing
	.14[b]	Tapping
	.15[a]	Dotting

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.09[c]	Finger dexterity
	.16[a]	Arm dexterity

PRODUCTION OF FABRICATED TEXTILE PRODUCTS (4, 6, 8-29 to 4, 6, 8-39)

4-26. Tailors and Tailoresses, Skilled

Train.	*Prof.*	
−.21		Intelligence

6-27. Fabrication of Textile Products, Semiskilled Workers

Train.	*Prof.*	
	.24[c]	Intelligence
	.12[b]	Immediate memory
	.21[a]	Substitution
	.15[a]	Arithmetic
	.17[c]	Spatial relations
	.11[c]	Location
	.24[c]	Number comparison
	.20[b]	Name comparison
	.16	Cancellation
	.18[b]	Pursuit
	.21[c]	Tracing
	.06[b]	Tapping
	.12[b]	Dotting
	.16[c]	Finger dexterity
	.38[a]	Hand dexterity
	.10[b]	Arm dexterity

PRODUCTION OF LUMBER AND TIMBER PRODUCTS (4, 6, 8-29 to 4, 6, 8-39)

4-33. General Woodworking, Skilled Workers

Train.	*Prof.*	
.12		Intelligence
.23		Substitution
.32[a]		Spatial relations
.34		Location
.24[a]		Finger dexterity

6-33. General Woodworking, Semiskilled Workers

Train.	*Prof.*	
	.12	Intelligence
	.45	Spatial relations
	.32	Location
	.13	Number comparison
	.06	Name comparison
	−.24	Pursuit
	−.16	Tracing
	−.16	Tapping
	−.14	Dotting

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

	.26	Finger dexterity
	.24	Hand dexterity
	.29	Arm dexterity

6–39. Miscellaneous Finished Lumber Products, Semiskilled Workers

Train.	*Prof.*	
	−.04[a]	Intelligence

PRODUCTION OF PAPER AND PAPER GOODS (4, 6, 8-41 to 4, 6, 8-42)

6-42. Paper Goods, Semiskilled Workers

Train.	*Prof.*	
	.23	Immediate memory
	−.25	Substitution
	.02	Arithmetic
	−.07	Spatial relations
	−.15	Location
	−.01	Number comparison
	−.21	Name comparison
	−.02	Pursuit
	−.21	Tracing
	.01	Tapping
	−.07	Dotting
	.07	Finger dexterity
	.09	Hand dexterity
	.11	Arm dexterity

PRINTING OCCUPATIONS (4, 6, 8-44 to 4, 6, 8-49)

4-44. Compositors and Typesetters, Skilled

Train.	*Prof.*	
.62		Intelligence
.29		Spatial relations
.35		Location
.54		Number comparison
.57		Name comparison
.41		Pursuit
.24		Tracing
.18		Tapping
.31		Dotting
.31		Interest

4-48. Pressmen and Plate Printers, Skilled

Train.	*Prof.*	
.00	.48	Intelligence
	.69	Immediate memory
	.80	Arithmetic
.58	−.02	Spatial relation

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.27[a]	Finger dexterity
	.24[a]	Personality

4-49. Printing and Publishing, Skilled Workers

Train.	*Prof.*	
−.20		Intelligence

8-49. Printing and Publishing, Unskilled Workers

Train.	*Prof.*	
	−.11	Intelligence
	.12[a]	Immediate memory
	.11	Substitution
	.15	Arithmetic
	.00[a]	Spatial relations
	.18[a]	Location
	.11[a]	Number comparison
	.07[a]	Name comparison
	.15[a]	Pursuit
	.12[a]	Tracing
	.30[a]	Tapping
	.14[a]	Dotting
	.24[b]	Finger dexterity
	.26[a]	Hand dexterity
	.16[a]	Arm dexterity

PRODUCTION OF CHEMICALS AND CHEMICAL PRODUCTS

(4, 6, 8-52 to 4, 6, 8-54)

4-52. Industrial Chemicals, Skilled Workers

Train.	*Prof.*	
.18[b]		Intelligence
.27[b]		Spatial relations
.17[b]		Location
.09[a]		Pursuit
.21[b]		Perceptual speed
.03[a]		Tapping

6-52. Industrial Chemicals, Semiskilled Workers

Train.	*Prof.*	
	.30[a]	Personality

8-52. Industrial Chemicals, Unskilled Workers

Train.	*Prof.*	
	.22	Intelligence
	.34	Finger dexterity

6-54. Ammunition, Semiskilled Workers

Train.	*Prof.*	
	.48	Intelligence

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.29	Spatial relations
	.30	Location
	.21	Name comparison
	.29	Pursuit
	.29[a]	Finger dexterity

8-54. Ammunition, Unskilled Workers

Train.	*Prof.*	
	.30[a]	Intelligence
	.16[a]	Immediate memory
	.16[a]	Spatial relations
	.25[a]	Location
	.20	Name comparison
	.10	Pursuit
	.23[a]	Perceptual speed
	.24[a]	Tracing
	.29[c]	Finger dexterity

PRODUCTION OF PETROLEUM AND COAL PRODUCTS
(4, 6, 8-55 to 4, 6, 8-56)

6-55. Refining of Petroleum, Semiskilled Workers

Train.	*Prof.*	
	.05	Intelligence
	.11	Immediate memory
	.34	Substitution
	.02	Arithmetic
	.20	Spatial relations
	.12	Location
	.21	Number comparison
	.22	Pursuit
	.00	Perceptual speed
	.19	Tracing
	.32	Tapping

PRODUCTION OF RUBBER GOODS (4, 6, 8-57)

6-57. Rubber Goods, Semiskilled Workers

Train.	*Prof.*	
	.12	Immediate memory
	.24[a]	Substitution
	.43	Arithmetic
	.20	Spatial relations
	.26	Location
	.19	Number comparison
	.12	Name comparison
	.51[a]	Cancellation
	.29	Pursuit

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

	.66[a]	Mechanical principles
	.10[a]	Tracing
	.18[a]	Tapping
	.26	Dotting
	.19[a]	Finger dexterity
	−.17	Hand dexterity
	.07	Arm dexterity

MANUFACTURE OF LEATHER AND LEATHER PRODUCTS
(4, 6, 8-59 to 4, 6, 8-62)

6-59. Leather, Semiskilled Workers

Train.	*Prof.*	
	.07	Tracing

4-60. Shoemakers and Shoe Repairmen, Skilled

Train.	*Prof.*	
−.34		Intelligence

4-61. Manufacture of Boots and Shoes, Skilled Workers

Train.	*Prof.*	
	.21[a]	Immediate memory
	.20	Substitution
	.00	Arithmetic
	.04[a]	Spatial relations
	.01[a]	Location
	.26[a]	Number comparison
	.25[a]	Name comparison
	.09[a]	Pursuit
	.07	Tracing
	.30[a]	Tapping
	.06	Dotting
	.04[a]	Finger dexterity

6-61. Manufacture of Boots and Shoes, Semiskilled Workers

Train.	*Prof.*	
	.17	Intelligence
	.29	Immediate memory
	.18	Substitution
	.14	Arithmetic
	.10	Spatial relations
	.07	Location
	.22	Number comparison
	.08	Name comparison
	.43	Cancellation
	.23	Pursuit
	.45	Tracing
	.10	Tapping

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

	.44	Dotting
	−.11[a]	Finger dexterity

METALWORKING OCCUPATIONS (4, 6, 8-71 to 4, 6, 8-95)

6-72. MANUFACTURE OF CLOCKS, WATCHES, JEWELRY, AND PRECIOUS METALS, SEMISKILLED WORKERS

Train.	*Prof.*	
	.04	Intelligence
	.36	Immediate memory
	.12	Arithmetic
	.10	Spatial relations
	.15	Location
	.07	Number comparison
	−.02	Name comparison
	−.11	Pursuit
	−.09	Tracing
	.13	Tapping
	.05	Dotting
	.28[b]	Finger dexterity
	.37	Hand dexterity
	.23	Arm dexterity

6-74. ELECTROPLATING, GALVANIZING, AND RELATED PROCESSES, SEMISKILLED WORKERS

Train.	*Prof.*	
	.12	Intelligence
	.04[b]	Finger dexterity
	.00[c]	Arm dexterity

4-75. MACHINISTS, SKILLED

Train.	*Prof.*	
.27[c]	−.04[a]	Intelligence
.12[a]	.11	Immediate memory
.11	.21	Substitution
.33[c]	.20[a]	Arithmetic
.24[b]	.23[b]	Spatial relations
.29[a]	−.06	Location
.02[a]	.25	Number comparison
−.02[a]	.29	Name comparison
	.47	Pursuit
.37[b]		Perceptual speed
.33[c]		Mechanical principles
.29[a]	.29	Tracing
.11[a]	−.04	Tapping
.23[a]	−.06	Dotting
.24[a]	.18	Finger dexterity
	.09	Hand dexterity
−.03[a]	.09	Arm dexterity
.32[a]		Personal data

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

4-76. Toolmakers and Die Sinkers and Setters, Skilled Workers

Train.	*Prof.*	
.39[c]	.32[a]	Intelligence
	−.21	Immediate memory
.44[a]	.13	Substitution
.49[a]	.10	Arithmetic
.39[c]	.32[a]	Spatial relations
	.20[a]	Location
.26[b]		Cancellation
	−.01	Pursuit
	.46	Mechanical principles
	−.01	Tracing
−.04	.32	Tapping
	.17	Dotting
.37	.10[a]	Finger dexterity

4-78. Machine Shop and Related Occupations, Skilled Workers

Train.	*Prof.*	
	.33[a]	Intelligence
	.06	Immediate memory
	.09	Substitution
	.33	Arithmetic
	.24	Location
	−.18	Number comparison
	.17	Name comparison
.05[a]		Cancellation
	−.07	Pursuit
	.64	Mechanical principles
	−.01	Tracing
	−.02	Tapping
	.24	Dotting
	.23[a]	Finger dexterity
	.32	Hand dexterity
	.36	Arm dexterity

6-78. Machine Shop and Related Occupations, Semiskilled Workers

Train.	*Prof.*	
	.09[a]	Intelligence
	.20	Immediate memory
	.05	Substitution
	.21	Arithmetic
	.17[a]	Spatial relations
	.25[a]	Location
	.20[a]	Number comparison
	.11	Name comparison
	.11	Pursuit

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.32	Perceptual speed
.24	Tracing
.11	Tapping
.28	Dotting
.28[a]	Finger dexterity
.01	Hand dexterity
−.11	Arm dexterity

4-80. TINSMITHS, COPPERSMITHS, AND SHEET METAL WORKERS, SKILLED

Train.	*Prof.*	
.43[b]	.22[a]	Intelligence
.34[a]		Immediate memory
.32[c]		Arithmetic
.34[c]	.20	Spatial relations
.25[a]	.19	Location
.25[a]		Number comparison
.14[a]		Name comparison
−.13	.33	Pursuit
.34[b]		Perceptual speed
.40[b]		Mechanical principles
.17[a]	.33	Tracing
−.01[a]	.48	Tapping
.02[a]		Dotting
.19[b]	.16	Finger dexterity
.17		Hand dexterity
.08		Arm dexterity
.48[a]		Personal data

4-81. MOLDERS, SKILLED WORKERS

Train.	*Prof.*	
	.08	Intelligence
	−.08	Arithmetic
	.10	Spatial relations
	.18	Location
	.32	Number comparison
	.20	Tracing
	.29	Tapping
	.23	Dotting
	.32[a]	Finger dexterity
	.40	Hand dexterity
.24	.34	Arm dexterity

8-81. MOLDERS, UNSKILLED WORKERS

Train.	*Prof.*	
.45		Spatial relations
.44		Mechanical principles
.37		Interest

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

4-84. STRUCTURAL AND ORNAMENTAL METAL WORKERS, SKILLED

Train.	*Prof.*	
.13		Intelligence
.25		Arithmetic
.45[a]		Spatial relations
.39		Location
.32		Perceptual speed
.43		Finger dexterity

6-84. STRUCTURAL AND ORNAMENTAL METAL WORKERS, SEMISKILLED

Train.	*Prof.*	
.40[a]		Spatial relations

4-85. WELDERS AND FLAME CUTTERS, SKILLED WORKERS

Train.	*Prof.*	
.31[b]	.09	Intelligence
−.38	.00	Immediate memory
−.01	.25	Substitution
.28[b]	.35	Arithmetic
.25[a]	.56[a]	Spatial relations
.10[a]	.10	Location
−.13	.14	Number comparison
−.04	.04	Name comparison
	.27	Cancellation
.05		Pursuit
.30[a]		Perceptual speed
.45[a]		Mechanical principles
.20	.53	Tracing
.23	.13	Tapping
.12[a]	.06	Dotting
.04[a]	.18	Finger dexterity
	.29	Hand dexterity
	.11	Arm dexterity
.35		Personal data

6-85. WELDERS AND FLAME CUTTERS, SEMISKILLED WORKERS

Train.	*Prof.*	
	.64	Perceptual speed

4-86. BLACKSMITHS, FORGEMEN, AND HAMMERMEN, SKILLED WORKERS

Train.	*Prof.*	
.21		Intelligence

4-87. HEAT TREATERS, ANNEALERS, AND TEMPERERS, SKILLED WORKERS

Train.	*Prof.*	
.39[a]		Perceptual speed
.41[a]		Mechanical principles

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

6-88. Mechanical Treatment of Metals (Rolling, Stamping, Forging, Pressing, etc.), Semiskilled Workers

Train.	*Prof.*	
	−.02	Intelligence
	.07	Immediate memory
	−.05	Substitution
	−.07[a]	Spatial relations
	−.09[a]	Location
	.29	Number comparison
	.06	Name comparison
	−.04	Cancellation
	.17	Pursuit
	.27	Perceptual speed
	−.02	Tracing
	.11	Tapping
	.08	Dotting
.21	.29[b]	Finger dexterity
	.11	Hand dexterity
	.00	Arm dexterity

6-88. Mechanical Treatment of Metals, Semiskilled Workers

Train.	*Prof.*	
.21		Finger dexterity

4-91. Furnacemen, Smelters, and Pourers, Skilled Workers

Train.	*Prof.*	
	.42[a]	Finger dexterity
	.19[a]	Hand dexterity

6-92. Production of Metal Products, Semiskilled Workers

Train.	*Prof.*	
	.59	Intelligence

6-93, 6-94. Fabrication of Metal Products, Semiskilled Workers

Train.	*Prof.*	
.16	.15	Intelligence
	.41[a]	Cancellation
.35		Finger dexterity

8-93, 8-94. Fabrication of Metal Products, Unskilled Workers

Train.	*Prof.*	
	−.18	Intelligence
	.07	Immediate memory
	.13	Substitution
	−.14	Arithmetic
	.15[a]	Spatial relations
	.08[a]	Location
	.01	Number comparison
	−.03	Name comparison

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.17	Pursuit
	.09	Tracing
	.06	Tapping
	.02	Dotting
	.15[a]	Finger dexterity
	.03	Hand dexterity
	.12	Arm dexterity

6-95. Inter-Industry Metal-Working, Semiskilled Workers

Train.	*Prof.*	
−.03	.16	Intelligence
.15	.20	Immediate memory
.34	.26	Substitution
.09	.09	Arithmetic
.24[a]	.24[a]	Spatial relations
.28	.24[a]	Location
.06	.19	Number comparison
.03	−.03	Name comparison
	.16	Pursuit
	.14	Mechanical principles
	.17	Tracing
.09	.12	Tapping
	.14	Dotting
.43[a]	.34[a]	Finger dexterity

ELECTRICIANS AND OCCUPATIONS IN MANUFACTURE OF ELECTRICAL EQUIPMENT (4, 6, 8-97 to 4, 6, 8-99, 5, 7, 9-00)

4-97. Electricians, Skilled

Train.	*Prof.*	
.50[c]	.44[a]	Intelligence
.25[c]		Immediate memory
.48[c]		Arithmetic
.35[c]	.54	Spatial relations
.03		Location
.05		Number comparison
.09		Name comparison
	.31	Pursuit
.40[b]		Perceptual speed
.42[c]		Mechanical principles
.26	.35	Tracing
−.38	.40	Tapping
−.28		Dotting
−.05	.25[a]	Finger dexterity
−.38		Hand dexterity
−.10		Arm dexterity
.28[a]		Personal data

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

4-98. Manufacture of Radios and Phonographs, Skilled Workers

Train.	*Prof.*	
	.07	Intelligence
	.19	Immediate memory
	−.04	Substitution
	−.01	Arithmetic
	.27[a]	Spatial relations
	.27[a]	Location
	.11	Number comparison
	−.15	Name comparison
	−.05	Cancellation
	.09	Pursuit
	.16	Tracing
	.16	Tapping
	.17	Dotting
	.12[a]	Finger dexterity

6-98. Manufacture of Radios and Phonographs, Semiskilled Workers

Train.	*Prof.*	
	−.04[a]	Intelligence
	.07[a]	Immediate memory
	.05[a]	Substitution
	.04[a]	Arithmetic
	.17[b]	Spatial relations
	.22[c]	Location
	.14[a]	Number comparison
	.09[a]	Name comparison
	.09[a]	Cancellation
	.17[b]	Pursuit
	.15[a]	Perceptual speed
	.20[b]	Tracing
	.13[b]	Tapping
	.07[b]	Dotting
.57[b]	.25[c]	Finger dexterity
.50[a]	.18	Hand dexterity
.54[a]	.03	Arm dexterity
	.50	Personality
	.02	Interest

8-98. Manufacture of Radios and Phonographs, Unskilled Workers

Train.	*Prof.*	
	−.03[a]	Intelligence
	−.34	Immediate memory
	.14	Substitution
	.11[a]	Arithmetic

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.16[a]	Spatial relations
	.24[a]	Location
	.17	Number comparison
	.09	Name comparison
	.29	Cancellation
	.13[a]	Pursuit
	.23[a]	Perceptual speed
	.10[a]	Tracing
	.02[a]	Tapping
	.13[a]	Dotting
	.16[a]	Finger dexterity

6-99. MANUFACTURE OF ELECTRICAL MACHINERY AND ACCESSORIES, SEMISKILLED WORKERS

Train.	*Prof.*	
	.01[a]	Intelligence
	.01[a]	Immediate memory
	.08[a]	Substitution
	−.05[a]	Arithmetic
	.03[a]	Spatial relations
	.04[a]	Location
	.11[a]	Number comparison
	−.04[a]	Name comparison
	.29	Cancellation
	.10[a]	Pursuit
	.30	Perceptual speed
	.07[a]	Tracing
	.10[a]	Tapping
	.12[a]	Dotting
	.34[c]	Finger dexterity
	.09[a]	Hand dexterity
	.16[a]	Arm dexterity

5-00. MANUFACTURE OF MISCELLANEOUS ELECTRICAL EQUIPMENT, SKILLED WORKERS

Train.	*Prof.*	
	.19	Intelligence
	.21	Immediate memory
	.17	Substitution
	.01	Arithmetic
	.23[a]	Spatial relations
	.23[a]	Location
	.17	Number comparison
	.13	Name comparison
	.21	Cancellation
	.33	Pursuit
	.05	Tracing
	.09	Tapping
	.01	Dotting
	.15[a]	Finger dexterity

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

7-00. Manufacture of Miscellaneous Electrical Equipment, Semiskilled Workers

Train.	*Prof.*	
	.20[a]	Intelligence
	.12	Immediate memory
	.01	Substitution
	.18[a]	Arithmetic
	.19[b]	Spatial relations
	.30[a]	Location
	.21[a]	Number comparison
	.25[a]	Name comparison
	.17	Cancellation
	.26[a]	Pursuit
	.29[c]	Perceptual speed
	.26[a]	Tracing
	.24[a]	Tapping
	.34[a]	Dotting
	.10[a]	Finger dexterity

9-00. Manufacture of Miscellaneous Electrical Equipment, Unskilled Workers

Train.	*Prof.*	
	−.08	Immediate memory
	−.06	Substitution
	.35	Arithmetic
	.12[a]	Spatial relations
	.19	Location
	.00	Number comparison
	.06	Name comparison
	−.34	Pursuit
	.35	Perceptual speed
	.43	Tracing
	.14	Tapping
	.04	Dotting
	−.27[a]	Finger dexterity
	−.01	Hand dexterity
	−.36	Arm dexterity

MANUFACTURE OF TRANSPORTATION EQUIPMENT

(5, 7, 9-02 to 5, 7, 9-05)

5-03. Building of Aircraft, Skilled Workers

Train.	*Prof.*	
.31	.56[a]	Intelligence
.01		Immediate memory
.20[a]		Arithmetic
.31[a]	.39[a]	Spatial relations
.17		Perceptual speed
.32[a]	.43[a]	Mechanical principles

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

7-03. Building of Aircraft, Semiskilled Workers

Train.	*Prof.*	
	−.03	Intelligence
	.17	Immediate memory
	.16	Substitution
	.33	Arithmetic
	.18[a]	Spatial relations
	.20[a]	Location
	.17	Number comparison
	.07	Pursuit
	−.15	Perceptual speed
	.15	Tracing
	.29	Tapping
	.16	Dotting
	.05	Finger dexterity

MANUFACTURE OF MISCELLANEOUS PRODUCTS (5, 7, 9-08 to 5, 7, 9-13)

5-08. Opticians, Lens Grinders, and Polishers, Skilled Workers

Train.	*Prof.*	
	.22[b]	Intelligence
	.40	Arithmetic
	.12	Spatial relations
	.22	Location
	.16	Tracing
	.24	Tapping
	.24	Dotting
	.05[a]	Finger dexterity
	.38	Personal data

7-09. Professional and Scientific Apparatus, Semiskilled Workers

Train.	*Prof.*	
	−.08	Spatial relations
	−.27	Mechanical principles
	−.53	Tapping
	−.27	Dotting
	.12	Finger dexterity

7-13. Miscellaneous Products, Semiskilled Workers

Train.	*Prof.*	
	.51[b]	Intelligence
	.60	Substitution
	.36[a]	Spatial relations
	.40	Location
	.27	Number comparison
	.24	Name comparison
	.57[a]	Cancellation

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

	.18	Pursuit
	.28	Tracing
	.46	Tapping
	.54	Dotting
	.23[a]	Finger dexterity
	.09	Hand dexterity
	.69	Arm dexterity

MISCELLANEOUS MANUFACTURING OCCUPATIONS (5, 7, 9-16 to 5, 7, 9-18)

7-16. Painters, except Construction and Maintenance, Semiskilled Workers

Train.	*Prof.*	
	.10	Intelligence
	.24	Immediate memory
	.17	Arithmetic
	.10	Spatial relations
	.06	Location
	.08	Number comparison
	.30	Name comparison
	.35	Pursuit
	.33	Tracing
	.46	Tapping
	.41	Dotting
	.09[a]	Finger dexterity
	.20	Hand dexterity
	.34	Arm dexterity

CONSTRUCTION OCCUPATIONS (5, 7, 9-16 to 5, 7, 9-18)

7-23. Construction and Machinery Operators, Semiskilled Workers

Train.	*Prof.*	
.15[a]		Intelligence
.10[a]		Immediate memory
.14[c]		Arithmetic
.09[b]		Spatial relations
.08[b]		Perceptual speed
.24[b]		Mechanical principles

5-25. Carpenters, Skilled Workers

Train.	*Prof.*	
.40[b]		Intelligence
.21[a]		Immediate memory
.36[a]		Substitution
.28[c]		Arithmetic
.30[b]		Spatial relations

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.29[b]		Perceptual speed
.27[b]		Mechanical principles
.20[a]		Personal data

5-27. PAINTERS, CONSTRUCTION AND MAINTENANCE, SKILLED WORKERS

Train.	*Prof.*	
.28		Intelligence

5-30. PLUMBERS, GAS FITTERS, AND STEAM FITTERS, SKILLED WORKERS

Train.	*Prof.*	
.26[a]		Intelligence
.10[a]		Immediate memory
.26[b]		Arithmetic
.32[a]		Spatial relations
.11		Location
.56		Pursuit
.23[a]		Perceptual speed
.26[a]		Mechanical principles
.37		Tracing
.41		Tapping
.16		Dotting
.18[a]		Personal data

TRANSPORTATION OCCUPATIONS (5, 7, 9-35 to 5, 7, 9-49)

5-36. CHAUFFEURS AND DRIVERS (BUS, TAXI, TRUCK, AND TRACTOR), SKILLED WORKERS

Train.	*Prof.*	
	.07[a]	Intelligence

7-36. CHAUFFEURS AND DRIVERS, SEMISKILLED WORKERS

Train.	*Prof.*	
.19[c]	.16[c]	Intelligence
	.04[a]	Arithmetic
.45[a]		Spatial relations
	.20[a]	Location
.49[b]	.21[c]	Mechanical principles
	.24[a]	Tapping
	.31[a]	Dotting
	.26[a]	Interest
	.48[c]	Personal data

5-43. MOTORMEN, STREET, SUBWAY, AND ELEVATED RAILWAY, SKILLED WORKERS

Train.	*Prof.*	
	.03[a]	Intelligence
	.16[a]	Location

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

	.17[a]	Mechanical principles
	.40[a]	Tapping
	.24[a]	Dotting

7-49. Transportation, Semiskilled Workers

Train.	*Prof.*	
.22[b]		Intelligence
.43[b]		Arithmetic
.22[a]		Spatial Relations

COMMUNICATION AND UTILITY OCCUPATIONS (5, 7, 9-51 to 5, 7, 9-54)

5-51. Power Station Operators, Skilled Workers

Train.	*Prof.*	
	.81	Intelligence

5-53. Linemen, Servicemen, Telegraph, Telephone, and Power, Skilled Workers

Train.	*Prof.*	
.20[a]		Intelligence
.49		Arithmetic
.31[a]		Tracing

TRADE AND SERVICE OCCUPATIONS (5, 7, 9-55 to 5, 7, 9-60)

5-57. Laundering, Cleaning, Dyeing, and Pressing, Skilled Workers

Train.	*Prof.*	
	.40	Arm dexterity

7-57. Laundering, Cleaning, Dyeing, and Pressing, Semiskilled Workers

Train.	*Prof.*	
−.31	.29	Intelligence
	.41	Immediate memory
	.34	Arithmetic
	.27[a]	Spatial relations
	.23[a]	Location
	.26[a]	Number comparison
	.27	Pursuit
	.11	Tracing
	.29	Tapping
	.33	Dotting
	.43	Finger dexterity
	.34[a]	Arm dexterity
	.58[a]	Personal data

9-59. Trades and Services, Unskilled Workers

Train.	*Prof.*	
	.12[b]	Intelligence

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.21[a]	Immediate memory
.20[a]	Substitution
.02	Arithmetic
.20[a]	Spatial relations
.18[a]	Location
.11[b]	Number comparison
.21[b]	Name comparison
.16[a]	Cancellation
.14[a]	Pursuit
.12[a]	Tracing
.15[a]	Tapping
.09[a]	Dotting
.06[c]	Finger dexterity
.15[c]	Hand dexterity
.24[c]	Arm dexterity

MISCELLANEOUS OCCUPATIONS (5, 7, 9-63 to 5, 7, 9-89)

9-63 to 9-65. NONPROCESS OCCUPATIONS IN MANUFACTURING, UNSKILLED WORKERS

Train.	*Prof.*	
−.11	.10[a]	Intelligence
	.00	Immediate memory
	.31[a]	Substitution
	−.14[a]	Arithmetic
	−.19[a]	Spatial relations
	.02[a]	Location
	.08[a]	Number comparison
	−.04[a]	Name comparison
	.40[a]	Cancellation
	.01[a]	Pursuit
	.42[a]	Perceptual speed
	−.08[a]	Tracing
	−.04[a]	Tapping
	.06[a]	Dotting
	.10[a]	Finger dexterity
	.16[a]	Hand dexterity
	.20[a]	Arm dexterity

7-68. PACKING, FILLING, LABELING, MARKING, BOTTLING, SEMISKILLED WORKERS

Train.	*Prof.*	
	.34[a]	Intelligence
	.37	Spatial relations
	.28	Location
	.20	Number comparison
	.26	Name comparison
	.38	Cancellation
	.17[a]	Pursuit

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

Train.	Prof.	
	.24	Tracing
	.16	Tapping
	.27	Dotting
	.17[a]	Finger dexterity
	.40	Hand dexterity
	.24	Arm dexterity

5-73. CRANEMEN, DERRICKMEN, HOISTMEN, AND SHOVELMEN, SKILLED WORKERS

Train.	*Prof.*	
	.24	Substitution
	.39	Spatial relations
	.14	Pursuit
	.28	Perceptual speed
	.63	Mechanical principles
	.28	Tracing
	.33	Tapping
	.22	Dotting
.11	−.02	Finger dexterity

7-73. CRANEMEN, DERRICKMEN, HOISTMEN, AND SHOVELMEN, SEMISKILLED WORKERS

Train.	*Prof.*	
	.65	Mechanical principles

5-80. MECHANICS AND REPAIRMEN, AIRPLANE, SKILLED WORKERS

Train.	*Prof.*	
.42[c]		Intelligence
.34[c]		Immediate memory
.34		Substitution
.42[c]	.43	Arithmetic
.35[c]	.20	Spatial relations
.25[b]	.07	Location
.22	.43	Number comparison
	.53	Name comparison
.19[b]	.50	Pursuit
.42[c]		Perceptual speed
.41[c]		Mechanical principles
.21[b]	.27	Tracing
.08[a]	.21	Tapping
.19[a]	.32	Dotting
.16[b]	−.24	Finger dexterity
	.12	Hand dexterity
	−.05	Arm dexterity
.40[c]		Personal data

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

5-81. MECHANICS AND REPAIRMEN, MOTOR VEHICLE, SKILLED WORKERS

Train.	*Prof.*	
.34[c]		Intelligence
.05[a]		Immediate memory
.14		Substitution
.32[c]	.19[a]	Arithmetic
.27[c]	.21[a]	Spatial relations
.21		Location
.15		Pursuit
.46[a]	−.12	Perceptual speed
.35[c]	.29[a]	Mechanical principles
.01		Tracing
−.02		Tapping
−.03		Dotting
.21[a]		Finger dexterity
.24[a]		Personal data

5-83. MECHANICS AND REPAIRMEN, SKILLED WORKERS

Train.	*Prof.*	
.34[c]	.04[a]	Intelligence
.24[b]		Immediate memory
.34		Substitution
.34[c]	.09	Arithmetic
.32[c]	.14	Spatial relations
.37		Location
.23	.08	Number comparison
	.04	Cancellation
.12[a]		Pursuit
.37[b]	.03	Perceptual speed
.34[c]		Mechanical principles
.19		Tracing
.09		Tapping
−.03	−.05	Dotting
.15[c]	.22[a]	Finger dexterity
	.18[a]	Hand dexterity
	.15	Arm dexterity
.41[a]	.48[a]	Personal data

7-83. MECHANICS AND REPAIRMEN, SEMISKILLED WORKERS

Train.	*Prof.*	
.46[a]	.51[a]	Intelligence
.19[a]		Immediate memory
.35[b]	.37[a]	Arithmetic
.30[a]	.29[a]	Spatial relations
.23[a]		Perceptual speed
.24[a]	.46[a]	Mechanical principles
	.20[a]	Finger dexterity

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

7-88. WAREHOUSING, STOREKEEPING, LOADING, UNLOADING, SEMISKILLED WORKERS

Train.	*Prof.*	
	.23[a]	Intelligence

FOREMEN (5-91 to 5-99)

5-91, 5-92. FOREMEN

Train.	*Prof.*	
	.22[c]	Intelligence
	.20[c]	Arithmetic
	.21[c]	Spatial relations
	.23[c]	Mechanical principles
	.15[c]	Personality
	.08[a]	Personal data

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. 1,000 or more cases.

APPENDIX B

AVERAGE VALIDITY COEFFICIENTS OF TESTS FOR JOBS CLASSIFIED ACCORDING TO ENTRY OCCUPATIONS

PUBLIC SERVICE WORK (0-X6)

0-X6.2. PROTECTIVE SERVICE WORK

Train.	*Prof.*	
.46[a]	.27[c]	Intelligence
.28[a]	.26[a]	Immediate memory
.30[b]	.15[a]	Arithmetic
.33[a]	.11[a]	Spatial relations
	.19[a]	Number comparison
	.24[a]	Name comparison
.30[a]		Perceptual speed
.41[a]	.27[a]	Mechanical principles
	.19[a]	Finger dexterity
	.24[b]	Personality
−.09	−.01[a]	Interest
.35		Personal data

MANAGERIAL WORK (0-X8)

0-X8.1. CLERICAL, ADMINISTRATIVE, FISCAL WORK

Train.	*Prof.*	
	.38[c]	Intelligence
	.20[a]	Arithmetic
	.32[a]	Cancellation
.16	.20[b]	Personality
	.53	Interest
	.37[a]	Personal data

0-X8.4. MANAGERIAL WORK, INDUSTRIAL

Train.	*Prof.*	
	.24[c]	Intelligence
	.20[c]	Arithmetic
	.21[c]	Spatial relations
	.22[c]	Mechanical principles
	.15[c]	Personality
	.08[c]	Interest
	.31	Personal data

COMPUTING WORK (1-X1)

1-X1.1. COMPUTING WORK

Train.	*Prof.*	
.42	.19[b]	Intelligence
	.34[a]	Immediate memory

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

.22	.36[a]	Substitution
.36	.34[b]	Arithmetic
	.37	Spatial relations
.49	.34[a]	Location
.29	.35[a]	Number comparison
	.38[a]	Name comparison
.11	.26[a]	Cancellation
	.42	Pursuit
.08	.44	Tracing
.24[a]	.16[a]	Tapping
	.11[a]	Dotting
	.13	Personality

RECORDING WORK (1-X2)

1-X2.0. General Recording Work

Train.	*Prof.*	
.49[c]	.27[c]	Intelligence
.46	.06[a]	Immediate memory
.44	.20[c]	Substitution
.61[c]	.22[c]	Arithmetic
.36	.27[c]	Number comparison
.19	.36[b]	Name comparison
	.19[a]	Cancellation
.38[c]		Mechanical principles
.01	−.16	Tapping
.16	.00[a]	Dotting
	.02[a]	Finger dexterity
	−.06[a]	Hand dexterity
	.13	Arm dexterity
	.08	Personality
	.35[a]	Personal data

1-X2.2. Typing

Train.	*Prof.*	
.40[c]	.27[c]	Intelligence
.32[c]	.39[a]	Immediate memory
.25[b]	.24[a]	Substitution
.48[c]	.21[a]	Arithmetic
.28[c]	.10	Spatial relations
.25[a]	.24	Location
.40[a]	.29[b]	Number comparison
.36[a]	.29[a]	Name comparison
.50	.24[a]	Cancellation
.22[a]	.16	Pursuit
.43[c]		Perceptual speed
.24[c]		Mechanical principles
.15[a]		Tracing
.25[a]	.06	Tapping

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.11[a]	.18[a]	Dotting
.12[b]	.25[a]	Finger dexterity
.30	.16	Hand dexterity
.09	−.09	Arm dexterity
	.13[a]	Personality
	−.02	Interest
.61[c]		Personal data

1-X2.3. Stenographic Work

Train.	*Prof.*	
.42[a]	.33[b]	Intelligence
.34[a]		Immediate memory
	.09	Substitution
.39[b]	.26[a]	Arithmetic
.19[a]	.36[a]	Spatial relations
.25[a]		Location
.12	−.02	Number comparison
.37		Name comparison
.66	.25[a]	Cancellation
.23[a]		Mechanical principles
.20		Tracing
.22[a]		Tapping
−.02[a]		Finger dexterity
	.22[a]	Personality
.28		Personal data

1-X2.8. Equipment and Material Checking

Train.	*Prof.*	
	.28[a]	Intelligence
	.40[a]	Substitution
	.03[a]	Arithmetic
	.34	Number comparison
	.40[a]	Cancellation
	.42[a]	Perceptual speed
.35[a]		Personal data

1-X2.9. Routine Recording Work

Train.	*Prof.*	
	.22[c]	Intelligence
	.20[a]	Immediate memory
	.24[a]	Substitution
	.14[a]	Arithmetic
	−.03[a]	Spatial relations
	.10[b]	Location
.37[a]	.28[c]	Number comparison
	.34[b]	Name comparison
	.14[c]	Cancellation
	.12[a]	Pursuit
	.14[a]	Tracing

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

	.21[a]	Tapping
	.18[b]	Dotting
	.20[a]	Personality
	.27[a]	Personal data

GENERAL CLERICAL WORK (1-X4)

1-X4.0. Classifying and Related Work

Train.	*Prof.*	
	.27[b]	Intelligence
	.30[a]	Immediate memory
	.07[a]	Substitution
	.34[a]	Arithmetic
	.04[a]	Spatial relations
	−.04[a]	Location
	.22[a]	Number comparison
	.24[a]	Name comparison
	.33[a]	Cancellation
	−.13	Pursuit
	.06	Perceptual speed
	−.09	Tracing
	−.04[a]	Tapping
	.05[a]	Dotting
	.34[a]	Finger dexterity
	.41	Hand dexterity
	.23	Personal data

1-X4.4. Clerical Machine Operating

Train.	*Prof.*	
.41[a]	.40	Intelligence
.46[a]		Arithmetic
.31[b]		Perceptual speed
	−.08	Finger dexterity
	.21	Hand dexterity
	.20	Arm dexterity

1-X4.9. Routine Clerical Work

Train.	*Prof.*	
.41[c]	.42[c]	Intelligence
	.34[a]	Immediate memory
.21[a]	.36[b]	Substitution
.40[c]	.37[c]	Arithmetic
.27[c]	.07	Spatial relations
	−.01	Location
.42	.24[b]	Number comparison
.41[a]	.24[b]	Name comparison
	.17[a]	Cancellation
	−.28	Pursuit

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.21[c]		Mechanical principles
	−.10	Tracing
	−.28	Tapping
	−.07	Dotting
	.25[c]	Finger dexterity
	.16[a]	Hand dexterity
	.18[a]	Arm dexterity
	.40[a]	Personality
	.35[a]	Personal data

PUBLIC CONTACT WORK (1-X5)

1-X5.0. General Public Contact Work

Train.	*Prof.*	
	−.08	Intelligence
	.29	Personality
	.63	Interest
	.60[a]	Personal data

1-X5.5. Selling

Train.	*Prof.*	
	.32[b]	Intelligence
	.72	Arithmetic
	.38[b]	Personality
	.30[c]	Interest
	.49[c]	Personal data

1-X5.7. Customer Service Work

Train.	*Prof.*	
	−.11[c]	Intelligence
	−.08[a]	Immediate memory
	−.16	Substitution
	−.03[a]	Arithmetic
	−.05[a]	Number comparison
	−.15[a]	Name comparison
	.02[b]	Cancellation
	.35[c]	Personality
	.34[b]	Interest
	.33[b]	Personal data

COOKING (2-X1)

2-X1.2. Quantity Cooking

Train.	*Prof.*	
−.31		Intelligence

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

PERSONAL SERVICE (2-X5)

2-X5.2. FOOD SERVING AND RELATED WORK

Train.	*Prof.*	
	−.15[a]	Intelligence
	−.11[a]	Arithmetic
	.14[a]	Number comparison
	−.17[a]	Name comparison
	−.27[a]	Cancellation
	−.09[a]	Hand dexterity
	−.01[a]	Arm dexterity

2-X5.6. ADULT CARE

Train.	*Prof.*	
.61[b]	.34	Intelligence
.59[b]		Arithmetic
.42[b]		Spatial relations
	.16[a]	Personality

2-X5.9. MISCELLANEOUS PERSONAL SERVICE WORK

Train.	*Prof.*	
−.02	.65	Intelligence
	.13[a]	Arithmetic
	.35	Spatial relations
	.20[a]	Location
	.03[a]	Mechanical principles
	.17[a]	Tapping
	.17[a]	Dotting
	.07[a]	Finger dexterity
	.25[a]	Interest

FARMING (3-X1)

3-X1.1. ANIMAL CARE

Train.	*Prof.*	
.05		Intelligence

MACHINE TRADES (4-X2)

4-X2.01. METAL MACHINING

Train.	*Prof.*	
.31[c]	.03[b]	Intelligence
.12[a]	−.02[a]	Immediate memory
.30[a]	.21[a]	Substitution
.34[c]	.20[a]	Arithmetic
.29[a]	.23[b]	Spatial relations
.35[c]	.19[a]	Location
.02[a]	.12	Number comparison

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

−.02[a]	.25	Name comparison
.24[b]		Cancellation
	.02	Pursuit
.37[b]		Perceptual speed
.33[c]	.64	Mechanical principles
.29[a]	.17[a]	Tracing
.08[a]	.16[a]	Tapping
.23[a]	.14[a]	Dotting
.25[b]	.17[a]	Finger dexterity
−.03[a]	.29[a]	Hand dexterity
	.30[a]	Arm dexterity
.32[a]		Personal data

4-X2.03. Stone or Glass Machining

Train.	*Prof.*	
	.20[b]	Intelligence
	.40	Arithmetic
	.12	Spatial relations
	.22	Location
	.16	Tracing
	.24	Tapping
	.24	Dotting
	.05[a]	Finger dexterity
	.38	Personal data

4-X2.10. Mechanical Repairing

Train.	*Prof.*	
.38[c]	.23[b]	Intelligence
.30[c]		Immediate memory
.25[a]		Substitution
.40[c]	.24[a]	Arithmetic
.33[c]	.05[c]	Spatial relations
.22[c]	−.06[a]	Location
.22	.23	Number comparison
	.53	Name comparison
	.04	Cancellation
.16[b]	.12[a]	Pursuit
.40[c]	−.03[a]	Perceptual speed
.37[c]	.34[a]	Mechanical principles
.19[b]	.01[a]	Tracing
.06[b]	.02[a]	Tapping
.17[b]	.03[a]	Dotting
.18[c]	.07[b]	Finger dexterity
.17	.12[a]	Hand dexterity
.08	−.03[a]	Arm dexterity
.37	−.13	Interest
.32[b]	.48[a]	Personal data

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

4-X2.45. Complex Textile Machine Operating

Train.	*Prof.*	
	.09[a]	Intelligence
	.26[a]	Immediate memory
	.29[a]	Substitution
	.22[a]	Arithmetic
	.34[a]	Spatial relations
	.26[a]	Location
	.14[a]	Number comparison
	.22[a]	Name comparison
	.23	Cancellation
	.35[a]	Pursuit
	−.15	Mechanical principles
	.17[a]	Tracing
	.14[a]	Tapping
	.04[a]	Dotting
	.11[b]	Finger dexterity
	.46	Hand dexterity
	.33	Arm dexterity

4-X2.46. Paper Machine Operating

Train.	*Prof.*	
.00	.48	Intelligence
	.69	Immediate memory
	.77	Arithmetic
.58	−.02	Spatial relations
	.27[a]	Finger dexterity
	.24[a]	Personality

4-X2.49. Hauling, Hoisting, and Drilling Machine Operating

Train.	*Prof.*	
	.06[b]	Intelligence
	.16[a]	Location
	.26[a]	Mechanical principles
	.40[a]	Tapping
	.24[a]	Dotting

CRAFTS (4-X6)

4-X6.18. Electrical Repairing

Train.	*Prof.*	
.41[c]	.55	Intelligence
.29[a]		Immediate memory
.33		Substitution
.45[c]		Arithmetic
.32[c]	.54	Spatial relations
.77		Location
.15		Number comparison

Less than 100cases, no letter symbol.
[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.09		Name comparison
.12[a]	.31	Pursuit
.39[a]		Perceptual speed
.40[c]		Mechanical principles
.27[a]	.35	Tracing
.01	.40	Tapping
.01		Dotting
.15[c]	.25[c]	Finger dexterity
−.38		Hand dexterity
−.10		Arm dexterity
.32[a]		Personal data

4-X6.21. Structural Work, Metal

Train.	*Prof.*	
.26[a]		Intelligence
.10[a]		Immediate memory
.26[b]		Substitution
.35[a]		Spatial relations
.28		Location
.56		Pursuit
.25[a]		Perceptual speed
.26[a]		Mechanical principles
.37		Tracing
.41		Tapping
.16		Dotting
.43		Finger dexterity
.18[a]		Personal data

4-X6.22. Structural Work, Wood

Train.	*Prof.*	
.40[b]		Intelligence
.21[a]		Immediate memory
.36[a]		Substitution
.28[a]		Arithmetic
.30[b]		Spatial relations
.29[b]		Perceptual speed
.27[b]		Mechanical principles
.20[a]		Personal data

4-X6.24. Structural Work, Plastic Materials

Train.	*Prof.*	
.28	.28	Intelligence

4-X6.28. Welding and Related Work

Train.	*Prof.*	
.26[c]	.09	Intelligence
−.40	.00	Immediate memory
−.01	.25	Substitution
.35[c]	.35	Arithmetic

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

.25[a]	.56[a]	Spatial relations
.10[a]	.10	Location
−.13	.14	Number comparison
−.04	.04	Name comparison
	.27	Cancellation
.05		Pursuit
.28[a]		Perceptual speed
.34[b]		Mechanical principles
.20	.20	Tracing
.23	.13	Tapping
.12[a]	.06	Dotting
.04[a]	.18	Finger dexterity
	.29	Hand dexterity
	.11	Arm dexterity
.35		Personal data

4-X6.30. Bench Work, Assorted Materials

Train.	*Prof.*	
	.12[a]	Intelligence
	.20[a]	Immediate memory
	.04[a]	Substitution
.33[a]	−.05[a]	Arithmetic
	.22[a]	Spatial relations
	.25[a]	Location
	.10[a]	Number comparison
	.03	Name comparison
	.07[a]	Cancellation
	.19[a]	Pursuit
.25[a]		Mechanical principles
	.11[a]	Tracing
	.13[a]	Tapping
	.10[a]	Dotting
.57[b]	.13[b]	Finger dexterity
.50[a]		Hand dexterity
.54[a]		Arm dexterity

4-X6.31. Bench Work, Metal

Train.	*Prof.*	
.39[c]	.33[a]	Intelligence
.30[b]		Immediate memory
.37[c]		Arithmetic
.33[c]	.34[a]	Spatial relations
.25[a]	.19	Location
.36		Number comparison
.23		Name comparison
	.33	Pursuit
.31[b]		Perceptual speed
.39[c]	.46	Mechanical principles
.18[a]	.33	Tracing

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

.04	.48	Tapping
.00		Dotting
.22[a]	.16	Finger dexterity
.48[a]		Personal data

4-X6.32. BENCH WORK, WOOD

Train.	*Prof.*	
.12		Intelligence
.23		Substitution
.32[a]		Spatial relations
.34		Location
.24[c]		Finger dexterity

4-X6.34. BENCH WORK, PLASTIC MATERIALS

Train.	*Prof.*	
.08		Intelligence
−.08		Arithmetic
.10		Spatial relations
.18		Location
.32		Number comparison
.20		Tracing
.29		Tapping
.23		Dotting
.32[a]		Finger dexterity
.40		Hand dexterity
.34	.24	Arm dexterity

4-X6.35. BENCH WORK, FABRIC, LEATHER, AND RELATED WORK

Train.	*Prof.*	
.01[a]		Intelligence
.01		Immediate memory
.10[a]		Arithmetic
.31[a]	.16	Spatial relations
.17		Perceptual speed
.32[a]		Mechanical principles

4-X6.36. BENCH WORK, PAPER PRODUCTS

Train.	*Prof.*	
−.20		Intelligence

4-X6.38. INSPECTING AND TESTING

Train.	*Prof.*	
	.50[a]	Intelligence
	−.03	Immediate memory
	−.13	Substitution
	.32	Arithmetic
	.43[a]	Spatial relations
	.21	Location
	−.18	Number comparison

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

	.17	Pursuit
	.52	Mechanical principles
	−.27	Tracing
	−.14	Tapping
	.09	Dotting
	.19[a]	Finger dexterity
	.13	Hand dexterity
	.24	Arm dexterity

4-X6.56. Typesetting and Related Work

Train.	*Prof.*	
.48		Intelligence
.29		Spatial relations
.35		Location
.54		Number comparison
.57		Name comparison
.41		Pursuit
.24		Tracing
.18		Tapping
.31		Dotting
.31		Interest

4-X6.61. Processing, Metal

Train.	*Prof.*	
−.18		Intelligence
.02		Arithmetic
.25		Spatial relations
.23		Location
.05		Number comparison
.01		Name comparison
−.13		Pursuit
.13		Tracing
−.08		Tapping
.06		Dotting
.13[a]	.42[a]	Finger dexterity
	.19[a]	Arm dexterity

4-X6.65. Processing, Fabric, Leather, and Related Work

Train.	*Prof.*	
	.40	Arm dexterity

4-X6.69. Refining and Related Work

Train.	*Prof.*	
	.05	Intelligence
	.11	Immediate memory
	.34	Substitution
	.20	Spatial relations
	.12	Location
	.21	Number comparison

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.22	Pursuit
	.00	Perceptual speed
	.19	Tracing
	.32	Tapping

OBSERVATIONAL WORK (6-X2)

6-X2.38. INSPECTING AND TESTING

Train.	*Prof.*	
	.09[a]	Intelligence
	.18[a]	Immediate memory
	.09[a]	Substitution
	.21[a]	Arithmetic
	.14[b]	Spatial relations
	.19[b]	Location
	.08[a]	Number comparison
	.22[a]	Name comparison
	.10[a]	Pursuit
	.26[a]	Tracing
	.08[a]	Tapping
	.08[a]	Dotting
	.14[c]	Finger dexterity
	.01	Hand dexterity
	.00[c]	Arm dexterity

6-X2.40. MACHINE TENDING, ASSORTED MATERIALS

Train.	*Prof.*	
	.38	Spatial relations
	.40	Location
	.27	Number comparison
	.24	Name comparison
	.18	Pursuit
	.28	Tracing
	.46	Tapping
	.54	Dotting
	.15	Finger dexterity
	.09	Hand dexterity
	.05	Arm dexterity

6-X2.41. METAL WORKING, MACHINE TENDING

Train.	*Prof.*	
	.43	Intelligence
	.42	Immediate memory
	.42	Substitution
	.32	Arithmetic
	.27[a]	Spatial relations
	.46	Location
	.43	Number comparison
	.22	Pursuit

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

	.32	Perceptual speed
	.40	Tracing
	.33	Tapping
	.48	Dotting
	.34[a]	Finger dexterity

6-X2.45. Fabric or Leather Working, Machine Tending

Train.	*Prof.*	
	.02[a]	Intelligence
	.25[a]	Immediate memory
	−.01[a]	Substitution
	−.04[a]	Arithmetic
	.08[a]	Spatial relations
	−.01[a]	Location
	.05[a]	Number comparison
	−.03[a]	Name comparison
	.14	Cancellation
	.10[a]	Pursuit
	.13[a]	Tracing
	.05[a]	Tapping
	.06[a]	Dotting
	.09[b]	Finger dexterity

6-X2.49. Hauling, Hoisting, and Drilling Equipment Operating

Train.	*Prof.*	
.18[c]	.17[c]	Intelligence
.10[a]		Immediate memory
	.24	Substitution
.14[c]	−.09	Arithmetic
.21[b]	.39	Spatial relations
	.19[a]	Location
	.14	Pursuit
.08[b]	.28	Perceptual speed
.36[c]	.23[c]	Mechanical principles
	.28	Tracing
	.34[a]	Tapping
	.40[a]	Dotting
.11	−.02	Finger dexterity
	.28	Interest
	.48[c]	Personal data

6-X2.61. Metal Process Equipment Tending

Train.	*Prof.*	
	.12	Intelligence

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

MANIPULATIVE WORK (6-X4)

6-X4.28. Welding and Riveting

Train.	*Prof.*	
−.03	−.03	Intelligence
.15	.15	Immediate memory
.34	.34	Substitution
.09	.09	Arithmetic
.33[a]	.24	Spatial relations
.28	.28	Location
.06	.06	Number comparison
.03	−.03	Name comparison
	.64	Perceptual speed
	.14	Mechanical principles
	.18	Tracing
.09	.10	Tapping
	.09	Dotting
.44[a]	.40[a]	Finger dexterity

6-X4.30. Bench Work, Assorted Materials

Train.	*Prof.*	
.16	.22[c]	Intelligence
	.08[c]	Immediate memory
	.14[c]	Substitution
	.08[b]	Arithmetic
	.14[c]	Spatial relations
	.18[c]	Location
	.14[c]	Number comparison
	.15[c]	Name comparison
	.29[a]	Cancellation
	.15[c]	Pursuit
	.28[c]	Perceptual speed
	.66[a]	Mechanical principles
	.17[c]	Tracing
	.15[c]	Tapping
	.15[c]	Dotting
.35	.23[c]	Finger dexterity
	.16[c]	Hand dexterity
	.28[c]	Arm dexterity
	.50	Personality
	.02	Interest

6-X4.31. Bench Work, Metal

Train.	*Prof.*	
	.11[a]	Intelligence
	.12[a]	Immediate memory
	.11	Substitution
	.00[a]	Arithmetic

Less than 100 cases, no letter symbol.
[a] 100 to 499 cases.
[b] 500 to 999 cases.
[c] 1,000 or more cases.

	.16[a]	Spatial relations
	.22[a]	Location
	.18[a]	Number comparison
	.01	Name comparison
	.38[a]	Cancellation
	.17[a]	Pursuit
	.12[a]	Perceptual speed
	−.27	Mechanical principles
	.14[a]	Tracing
	.06[a]	Tapping
	.15[a]	Dotting
.21	.12[a]	Finger dexterity
	.12	Hand dexterity
	.13	Arm dexterity

6-X4.34. BENCH WORK, PLASTIC MATERIALS AND PAINT

Train.	*Prof.*	
	.10	Intelligence
	.24	Immediate memory
	.17	Arithmetic
	.10	Spatial relations
	.06	Location
	.08	Number comparison
	.30	Name comparison
	.35	Pursuit
	.33	Tracing
	.46	Tapping
	.41	Dotting
	.09[a]	Finger dexterity
	.28	Hand dexterity
	.34	Arm dexterity

6-X4.35. BENCH WORK, FABRIC, LEATHER, AND RELATED WORK

Train.	*Prof.*	
.22[b]	.23[c]	Intelligence
	−.12[b]	Immediate memory
	.24[a]	Substitution
.43[b]	.13[a]	Arithmetic
.22[a]	.15[c]	Spatial relations
	.10[c]	Location
	.23[c]	Number comparison
	.19[b]	Name comparison
	.38[a]	Cancellation
	.17[b]	Pursuit
	.21[c]	Tracing
	.08[c]	Tapping
	.14[b]	Dotting

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

	.14[c]	Finger dexterity
	.38[a]	Hand dexterity
	.16[b]	Arm dexterity
	.26	Interest

6-X4.36. Bench Work, Paper Products

Train.	*Prof.*	
	.23	Immediate memory
	−.25	Substitution
	.02	Arithmetic
	−.07	Spatial relations
	−.15	Location
	.07	Number comparison
	−.02	Name comparison
	−.02	Pursuit
	−.21	Tracing
	.01	Tapping
	−.07	Dotting
	.09[a]	Finger dexterity
	.09	Hand dexterity
	.14	Arm dexterity

6-X3.7. Bench Work, Foods and Related Work

Train.	*Prof.*	
	.10[b]	Intelligence
	.29[a]	Immediate memory
	.17[a]	Substitution
	.22[a]	Arithmetic
	.10[a]	Spatial relations
	.12[a]	Location
	.20[a]	Number comparison
	.23[a]	Name comparison
	.29	Pursuit
	.09	Tracing
	.17	Tapping
	.14	Dotting
	.07[b]	Finger dexterity
	.12[a]	Hand dexterity
	.21[a]	Arm dexterity

6-X4.40. Machine Operating, Assorted Materials

Train.	*Prof.*	
	−.12	Intelligence
	.35	Spatial relations
	.25[a]	Finger dexterity

6-X4.41. Metal Working Machine Operating

Train.	*Prof.*	
	.35[a]	Intelligence

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

	.07	Immediate memory
	−.06	Substitution
	.18[a]	Spatial relations
	−.20	Location
	−.29	Number comparison
	.06	Name comparison
	−.04	Cancellation
	.05	Pursuit
	.44	Mechanical principles
	−.14	Tracing
	−.06	Tapping
	.03	Dotting
	.27[b]	Finger dexterity

6-X4.42. WOOD WORKING MACHINE OPERATING

Train.	*Prof.*	
	−.02[a]	Intelligence
	.45	Spatial relations
	.32	Location
	.13	Number comparison
	.12	Name comparison
	−.24	Pursuit
	−.16	Tracing
	−.40	Tapping
	−.14	Dotting
	.26	Finger dexterity
	.24	Hand dexterity
	.29	Arm dexterity

6-X4.43. STONE OR GLASS WORKING MACHINE OPERATING

Train.	*Prof.*	
	−.10	Intelligence
	.12	Substitution
	−.06	Arithmetic
	−.04	Spatial relations
	.46[a]	Location
	.15	Number comparison
	.10	Name comparison
	−.01	Pursuit
	−.07	Tracing
	−.08	Tapping
	.10	Dotting
	.01[a]	Finger dexterity
	.03	Hand dexterity
	.22	Arm dexterity

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

6-X4.45. Fabric or Leather Working Machine Operating

Train.	*Prof.*	
−.31	.13[a]	Intelligence
	.14[a]	Immediate memory
	.25[a]	Substitution
	.22[b]	Arithmetic
	.10[c]	Spatial relations
	.16[c]	Location
	.20[b]	Number comparison
	.19[a]	Name comparison
	.17[b]	Pursuit
	.15[b]	Tracing
	.18[b]	Tapping
	.21[b]	Dotting
	.12[c]	Finger dexterity
	−.17	Hand dexterity
	.15[a]	Arm dexterity
	.58[a]	Personal data

6-X4.48. Press Forming and Related Work

Train.	*Prof.*	
	.11	Intelligence
	−.04	Substitution
	−.13[a]	Spatial relations
	−.05	Location
	.24	Pursuit
	.27	Perceptual speed
	.15	Tracing
	.31	Tapping
	.23	Dotting
	.34[a]	Finger dexterity
	.11	Hand dexterity
	.00	Arm dexterity

6-X4.60. Processing, Assorted Materials

Train.	*Prof.*	
	.30[a]	Intelligence
	.16[a]	Immediate memory
	.16[a]	Spatial relations
	.24[a]	Location
	.20	Name comparison
	.10	Pursuit
	.23[a]	Perceptual speed
	.24[a]	Tracing
	.29[c]	Finger dexterity
	.30[a]	Personality

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases.

[b] 500 to 999 cases.

[c] 1,000 or more cases.

6-X4.67. Processing, Foods and Related Work

Train.	*Prof.*	
	−.30	Intelligence
	−.37	Hand dexterity
	−.28	Arm dexterity

ELEMENTAL WORK (6-X6)

Train.	*Prof.*	
.56[a]	.22	Intelligence
.33[a]		Immediate memory
.46[c]		Arithmetic
.37[a]		Spatial relations
.51[a]		Perceptual speed
.38[a]		Mechanical principles
	.34	Finger dexterity

Less than 100 cases, no letter symbol.

[a] 100 to 499 cases. [b] 500 to 999 cases. [c] 1,000 or more cases.

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